

# Appendix H

**CONTROLLED WATERS IMPACT APPRAISAL**



# New Thames Crossing East of Reading

## Controlled Waters Impact Appraisal

On behalf of **Wokingham Borough Council**

Project Ref: 37006/3501 | Rev: 01 | Date: August 2016

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## Document Control Sheet

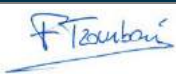

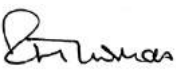
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# 1 Introduction

## 1.1 Preamble

Peter Brett Associates LLP (PBA) has been commissioned by Wokingham Borough Council (WBC), the Client, to provide a controlled waters impact appraisal for the proposed new Thames crossing east of Reading. This report is therefore intended to provide input to an Appraisal Summary Table (AST) in support of a Strategic Outline Business Case (SOBC) being prepared by WBC.

This appraisal reviews readily available information in order to assess: the likely existing geological and hydrogeological conditions; the potential for contamination associated with current land use; recorded pollution incidents; and identification of the key controlled waters receptors located within 1km of the proposed bridge alignment. This report presents a qualitative impact assessment to controlled waters and assesses the potential presence of environmental constraints to the proposed development.

The impact assessment to identified controlled waters receptors has been carried out using the guidelines within the Road Drainage and the Water Environment, Design Manual for Roads and Bridges, "Reporting of Significance of Potential Effects" Table included in Annex IV, Section 3, Part 10, Volume 11, (DMRB, 2009).

## 1.2 Proposed Scheme

The New Thames Crossing is proposed on the east side of Reading town centre, linking A4155 Henley Road/Caversham Park Road junction (via Caversham Lakes access road) north of the river, with Thames Valley Park roundabout south of the river.

No further details on the design of the bridge structure are available at the time of reporting.

## 1.3 Scope of Works

The scope of works has been set out in an 'Environmental Services Brief Document' produced by WBC. This report falls under the 'Water Environment' remit, with the provided scope of works identifying the following project input objectives:

- A desk based review of publicly available information relating to local watercourses and water quality to identify key sensitive receptors which may be affected by the scheme
- A request for water quality data from local regulators including the Environment Agency. Review the extent and quality of the available data to assess its suitability to inform the assessment of the impact of the crossing on water quality at this stage and for future stages of the project (i.e. to support flood defence consent applications, requiring a Water Framework Directive assessment).
- The outputs of the above should be utilised to undertake an assessment of the impact of the crossing on the water environment with regards to water quality.

## 1.4 Sources of Information

The following sources of information were used in preparation of this report:

- PBA walkover inspection – selected key photographs are presented in **Annex A**;

- Borehole Records held by the British Geological Survey (BGS) as accessed via their website, [www.bgs.ac.uk/data/boreholescans/home.html](http://www.bgs.ac.uk/data/boreholescans/home.html). Where records have been referred to they have been included in their entirety in **Annex B**;
- BGS Geological Map held by PBA;
- MAGIC website <http://www.magic.gov.uk> which provides authoritative geographic information about the natural environment from across government. The information covers rural, urban, coastal and marine environments across Great Britain. It is presented in an interactive map which can be explored using various mapping tools.
- Third-party reports on the construction and environmental monitoring of the Thames Valley Park landfill site, obtained from the Environment Agency. Key extracts from the third part monitoring reports are included in **Annex C**.
- Environmental data on controlled waters and recorded pollution incidents obtained from the Environment Agency and from the Environment Agency Website 'What's in Your Backyard' (<http://apps.environment-agency.gov.uk/wiyby/>).
- Web-based Ordnance Survey (OS) historical mapping ([www.old-maps.co.uk](http://www.old-maps.co.uk))

## 2 Site Location and Land Use

### 2.1 Site Location and Setting

The proposed route comprises a corridor of land that crosses the River Thames in a north south orientation. The proposed bridge alignment links the A4155 Henley Road (at the junction with Caversham Park Road) to the north and the Thames Valley Park Drive to the south.

The northern alignment is within a setting of historical gravel pits currently known as the Caversham Lakes but also includes the 2000m long Pinsent and Redgrave Rowing Lake which was opened in 2006. The surrounding area is predominantly occupied by the historical gravel pits, now either restored or partially flooded. The southern alignment comprises river floodplain and is currently occupied by public open space (grassland).

The route is centred on approximate National Grid Reference (NGR) SU 737 752. The proposed new bridge is located within both the South Oxfordshire District and Wokingham Borough Council.

A site location plan is presented as **Figure 1**.

### 2.2 Current Land Use

The current land-use information is based on a walkover inspection undertaken by a PBA representative on the 19th July 2016. Photographs taken during the site walkover are presented in **Annex A**. Pertinent features observed during the site walkover are presented on **Figure 2**.

#### 2.2.1 On Site

##### Southern Approach

The southern extent of the proposed route originates from a roundabout off Thames Valley Park Drive.

A review of readily available web based Ordnance Survey (OS) mapping ([www.old-maps.co.uk](http://www.old-maps.co.uk)) indicates that the area located on the southern bank of River Thames comprises a former landfill, which has been restored to publicly accessible grassland. Based on records obtained from the Environment Agency, the landfill was active during the late 1980s and was reportedly infilled with pulverised fuel ash (PFA) originating from the Central Electricity Generating Board (CEGB) Lower Earley power station (see Section 3.2).

The ground surface was observed as being flat, with no visible depressions or mounds that might be suggestive of differential settlement occurring.

A drainage ditch, considered to be man-made and possibly associated with the restoration of the landfill, was observed running in a southeast / northwest direction across the proposed route and discharging into River Thames. Two bridges, both crossing the ditch connect the western and eastern portions of the area

A number of footpaths cross the area in an east / west and north / south direction.

A pond, approximately 3,500m<sup>2</sup> in size, was also observed 150m to the east of the proposed bridge alignment. A line of trees and a hedge border the area to the south along Thames Valley Park Drive; additional trees and shrubs are also present alongside the ditch alignment and adjacent to the pond to the southeast. Further shrubs and occasional mature trees were also observed alongside the River Thames.

### Northern Approach

The northern extent of the proposed bridge alignment is situated off the A4155 and originates from the A4155 (Henley Road and Caversham Park Road junction). The proposed alignment runs in a southerly direction approximately following the route of an existing road that provides access to the Redgrave and Pinsent Rowing Lakes and associated boathouses.

An area of undeveloped agricultural land, with no evidence of historical mineral extraction works, was observed adjacent to the south of the A4155 adjacent to the north-western part of the proposed route.

A number of structures associated with the recreational use of the lakes, are present adjacent to the existing road, at the southern extent of the access road adjacent to the Pinsent and Redgrave Rowing Lake. It was not possible to gain direct access to the commercial buildings or the associated compounds at the time of the walkover. These comprised:

- The Sherriff Boathouse which is home to the British International Rowing Training facility, being the easternmost set of buildings;
- The 'Environment Agency – Caversham Lakes Site' comprising a number of single storey buildings (portacabins), areas of hardstanding and marina docks. At the time of the visit the outer area of Environment Agency compound appeared to be largely covered hardstanding that was observed to be in good condition. Plant and equipment associated was also observed within the compound;
- A water ski centre (Isis Water-ski and Wakeboard) is also present adjacent to the east of the access road.

### 2.2.2 Off Site

- **North:** the area to the north of the proposed route is defined by the A4155/Henley Road running in an east / west direction, with the residential area associated with Caversham Park Village beyond.
- **West:** the area to the west of the alignment comprises partially flooded gravel pits and the River Thames. The Thames and Kennet Marina and the residential area associated with Lower Caversham are also located at about 1.2km to the west of the proposed route.
- **South:** the area to the south is defined by the Thames Valley Park Drive with residential, commercial and small-scale industrial development beyond. The Thames Valley Business Park is situated adjacent to the south and southeast and comprises a large number of three to four storey commercial buildings with areas of associated landscaping and car parking.
- **East:** the area to the east of the alignment comprises partially flooded gravel pits, including Sonning Eye Lake and the River Thames. A number of ponds/lakes, likely artificial in nature, are located further to the east between about 430m and 500m from the proposed bridge alignment.

## 3 Geological and Environmental Setting

### 3.1 Geology – Published Information

#### 3.1.1 Published Information – BGS Geological Map

The 1:50,000 scale geological map of the area (BGS. 2000. Sheet 268 Reading) indicates the study area is underlain by the following geological sequence.

##### Superficial Deposits

Superficial deposits are present across the entire study area. These deposits comprise the following sequence:

- Alluvium: Alluvium is shown to outcrop at the surface within the southern 50% and the northern 10% of the proposed alignment. The Alluvium is marked in the vicinity of the River Thames where the river channel has partially or fully eroded the Langley Silt. The alluvium is shown to be underlain by the Langley Silt Member (where still present) and/or the Kempton Park Gravel Formation.
- Langley Silt Member: This stratum is shown to outcrop at the surface in the northern and central parts of the proposed bridge alignment where the Alluvium is absent. Langley Silt is described as interbedded yellow brown sandy clay and silt. The Langley Silt is shown to directly overlie the Kempton Park Gravel Formation.
- Kempton Park Gravel Formation: The Kempton Park Gravel Formation is shown to underlie the entire study area beneath the Langley Silt or Alluvium and is shown to outcrop at the surface within the central part of the proposed alignment where the Alluvium and the Langley Silt are shown to be absent. Kempton Park Gravel is described as Quaternary superficial sand and gravel deposits originating from river terrace channels.

##### Solid Geology

At depth beneath the Kempton Park Gravel Formation, the entire study area is shown to be underlain by the Seaford and Newhaven Chalk Formation. This stratum is described as soft to medium hard white chalk with numerous marl seams and flint bands.

##### Mineral Workings

An area of worked ground is present beneath approximately 50% of the proposed bridge alignment route. It is understood that the worked ground represents an area of gravel extraction that led to the formation of the Caversham Lakes adjacent to the north of the River Thames. The worked ground is marked on the BGS geological map of the area (BGS, 2000) in an area that closely follows the geological boundary where the Kempton Park Gravel is shown to outcrop at the ground surface, suggesting that superficial deposits (Alluvium and/or Langley Silt) have been removed and the underlying Kempton Park gravels left exposed at the ground surface. The areas that are marked as 'worked ground' are currently occupied by flooded gravel pits and have not been backfilled.

To the south of the River Thames an area of 'Made Ground' is shown to underlie approximately 200m of southern bridge approach on the BGS Geological Map. This section of land is understood to comprise landfill and is discussed further in **Section 3.2** below.

#### 3.1.2 BGS Borehole Records

There are a number of BGS borehole records within 1km of the site centre. The available records are mostly located adjacent to the proposed bridge alignment to the northwest and to the south southeast. Additional exploratory hole records are located at about 100m to the west and 580m to the northeast of the proposed bridge alignment.

The records identified clayey, gravelly silt and clayey, gravelly silt, overlying sandy gravel with occasional layers of clayey gravel. The superficial strata are underlain by medium dense chalk with occasional gravel of flint.

The above records indicated that the area is generally underlain by Alluvial deposits over the Langley Silt Member to a depth of approximately 2.0m bgl. The base of the Kempton Park Gravel was recorded at variable depths of between about 4.0m and 8.4m below ground level (bgl), likely indicating the presence of deeper former river channels underlying the area. The Seaford and Newhaven Chalk Formation was recorded to a maximum proven depth of 201.5m bgl.

Table 3.1 Summary of Historical Exploratory Hole Records

Strata	Base level (m bgl)	Typical Description
Topsoil	0.2 to 0.4	Medium dense, dark brown, silty SAND to silty CLAY.
Alluvium	0.4 to 1.5	Firm to stiff, light brown, gravelly, sandy CLAY to clayey, gravelly SILT.
Langley Silt Member	1.0 to 2.0	Stiff, brown sandy clayey SILT.
Kempton Park Gravel	4.0 to 8.4	Dense, orange/brown, slightly clayey sandy GRAVEL.
Chalk Group	201.5	Medium dense, white CHALK.

## 3.2 Landfill Sites

### 3.2.1 On-site

According to the Environment Agency (EA) website, Thames Valley Park landfill site is located beneath the southern extent of the proposed bridge alignment. The landfill site is located between Thames Valley Park Drive and the River Thames and underlies approximately 300m of the proposed route. According to the EA website the landfill received special waste that may include flammable, irritant, toxic harmful or corrosive properties.

A freedom of information request was made to the Environment Agency (EA) in connection with the subject site area. Information was provided by the EA regarding this landfill and may be summarised as follows:

- Waste disposal license, reference 54/12/4/231 dated 31st March 1988, indicates that the landfill licence holder was Thames Valley Park Ltd. The landfill occupies land at the former CEGB Power Station, North Early Reading at National Grid Reference SU744 745.

- The waste disposal license states that the *“landfill shall only be used for the disposal of pulverised fuel ash (PFA) contaminated with low levels of asbestos and other materials removed during the realignment of the River Thames Flood Plain at North Earley and other inert materials excavated from within the site”*.

*“Asbestos classified as Special Waste (Control of Pollution [Special Waste] Regulations 1980, as specified in Waste Management Paper 23) excavated as discreet pockets of asbestos fibre during the above flood plain realignment works, shall not be deposited at the site”*.
- The landfilled waste arisings were won from excavations which included stockpiles and a zone of earlier buried Pulverised Fuel Ash (PFA), in order to facilitate the future development of the site into a business park. The PFA was to be relocated to a series of borrow pits that were excavated adjacent to the River Thames and hence forming the current landfill area.
- Alluvial clay from the landfill area excavations was to be placed and compacted against the base and sides of the excavation to provide a minimum thickness of 2m on all sides and 0.5m thick layer on the base. There was a minimum retained 0.5m thick gravel layer above the underlying Chalk.
- The licence required a buffer zone of 20m of undisturbed gravel to remain in-situ between the River Thames and the waste infill.
- Once the infilling reached the final waste level, the licence states that the PFA was to be covered with a *“geotextile membrane, 0.5m thick layer of gravel and further geotextile membrane, followed by a capping of alluvial clay of minimum with a minimum thickness of 0.5m.”*
- Leachate testing carried out on the PFA indicated high levels of mobile sulphates as SO<sub>4</sub> (up to 2780mg/l), metals and Toluene was identified within the landfill cells.
- Compliance groundwater and surface water monitoring data has not been provided. Based on the information reviewed and the Waste Disposal License Conditions for Thames Valley Park (Application Number: 54/12/4/231), it is apparent that compliance monitoring data from on-site waterbodies and the nearby groundwater bodies may not have been required as part of the landfilling operation. In addition, there is no available information on ground gas concentrations or leachate levels from within the landfill.

### 3.2.2 Off-site

A number of other historical landfills operated within 1km of the proposed bridge alignment. The closest sites are adjacent to the south of the proposed route and are associated with the historical Central Electricity Generating Board (CEGB) power station at Lower Earley. Table 3.2 presents a summary of the available landfill records for these sites which has been obtained from the EA website ‘What’s in your backyard?’

Table 3.2 Summary of Historical Exploratory Hole Records

Landfill Name	Distance and direction from proposed route	Operational Dates	Waste Accepted	Control Measures
Central Electricity Generating Board	410m to the East	31 Dec 1945 – n/a	Industrial, Inert	n/a

Power Station	350m to the East	31 Dec 1945 – 31 Dec 1990	Inert	n/a
Thames Valley Park <sup>(1)</sup>	170m to the Southeast	30 June 1989 - na	Special	n/a

(1) These are cells of the Thames Valley Park landfill site that lies outside the proposed route.

The historical landfills have all been restored to either public accessible grassland or commercial use as part of the Thames Valley Business Park development.

On the basis of the records provided it is likely that the 'CEGB' and the 'Power Station' landfills were the source of the PFA used to infill the Thames Valley Park Landfills between 1988 and 1990. The CEGB and Power Station Landfills reportedly received waste from 1945 and it is understood that these sites were reprofiled with stockpiles of PFA removed to make way for the Thames Valley Business Park Development (TVP). It is understood that PFA landfill still remains beneath TVP.

### 3.3 Summary of Pollution Incidents to Controlled Waters

The available environmental data provided by the Environment Agency records that no substantiated pollution incidents to controlled waters occurred adjacent to the proposed route or on its immediate vicinity.

All the recorded pollution incidents that occurred along the proposed route or on its immediate vicinity are associated with unauthorised fly-tipping to land. The most recent pollution incident occurred in June 2005 and resulted in a Category 3 (Minor) impact to water.

## 4 Groundwater Receptors

### 4.1 Controlled Waters - Groundwater

The following table summarises information recorded in the available environmental data regarding hydrogeology and groundwater vulnerability.

Table 4.1 Summary of Groundwater Information

Item	Details
Aquifer Classification	<p>Superficial – Alluvium – Secondary A Aquifer</p> <p style="padding-left: 40px;">Langley Silt Member – Unproductive Strata</p> <p style="padding-left: 40px;">Kempton Park Gravel – Secondary A Aquifer</p> <p>Bedrock – Seaford and Newhaven Chalk Formation – Principal Aquifer</p>
Depth to Groundwater	<p>According to BGS Record SU77SW614, located adjacent to south of the proposed bridge alignment, groundwater was struck in the base of the alluvium at 0.95m bgl. Borehole record SU77SW/14, 50m to the west of the proposed route identified groundwater at 1.0m bgl within the base of the alluvium.</p> <p>Leachate level information from within the on-site landfill cells is not available and as such there may be perched bodies within the lined landfill area.</p>
Groundwater Flow Direction	<p>In consideration of the review of the local geological information it is likely that the shallow groundwater within the Alluvium and Kempton Park Gravel will be in hydraulic continuity with the groundwater in the Chalk aquifer, given that the Langley Silt member is absent in part and therefore forms one groundwater body.</p> <p>Given the setting of the proposed route it is likely that the groundwater flow direction will be variable, although on balance it is likely to flow towards the east in the general direction of the flow of the River Thames. It should be noted however that a groundwater abstraction situated 100m to the west of the proposed route and a significant potable abstraction nearby at Play Hatch (See below)</p>

	<p>could locally influence the groundwater flow direction in the study area.</p> <p>The local hydrogeology map of the area (Sheet 7 South West Chilterns, IGN 1978) indicates that the potentiometric surface of the Chalk is around 35m Above Ordnance Datum (mAOD) (in August 1976), with a ground level of around 37mAOD across the proposed bridge alignment. The groundwater contours indicate a flow direction towards the east within the Chalk aquifer. The data therefore suggests that groundwater within the study area is likely to be shallow, probably &lt;2m bgl and flowing towards the east</p>
<p>Groundwater Abstraction (radius 1km)</p>	<p>According to the data provided in the EA FOI request, several groundwater abstractions are located within 1km of the proposed route:</p> <ul style="list-style-type: none"> <li>- The closest abstraction is located approximately 100m to the west of the proposed bridge alignment and is reportedly used for mineral washing. Information provided indicates this abstraction is from the superficial Kempton Park Gravels. The maximum permitted abstraction is for 210,860m<sup>3</sup> per annum, with the licence registered to Tarmac Aggregates Ltd.</li> <li>- It is understood that a Thames Water potable groundwater abstraction is located approximately 570m to the northeast at Play Hatch. Information provided by the EA indicates that this borehole abstracts from the Chalk. The EA FOI data does provide a borehole grid reference; however, its location has been positioned based on local knowledge. The abstraction is licenced to abstract up to 2,654,920m<sup>3</sup> per annum.</li> <li>- The next closest abstraction is located approximately 600m to the west of the bridge alignment used for commercial industrial and public service purposes (drinking, cooking, sanitary, washing), licensed to Wokingham Waterside Centre Ltd. This borehole reportedly abstracts from the underlying chalk aquifer with a maximum permitted volume of 2,600m<sup>3</sup> per annum.</li> <li>- A further abstraction is located 1km to the northeast of the proposed</li> </ul>

	<p>bridge alignment, associated with general agricultural use (spray irrigation). Groundwater is reportedly abstracted from the Kempton Park Gravels at this location. The maximum permitted abstraction is for 5591m<sup>3</sup> per annum, with the licence registered to the Trustees of Phillimore Farms.</p>
Source Protection Zone (SPZ)	<p>The proposed bridge alignment crosses both an SPZ 3 (total catchment) and an SPZ 2 (Outer Zone). The extent of which are shown on Figure 2.</p> <p>The southern 500m of the proposed bridge approach route is not located within a groundwater SPZ. The central 450m of the route is located with an SPZ 3 with the remaining 650m of the north of the route underlain by an SPZ 2.</p> <p>The Source Protection Zones are both associated with the potable abstraction borehole at Play Hatch, located approximately 570m to the northeast of the proposed bridge alignment at its closest point. An SPZ 1 associated with the abstraction is located approximately 200m to the northwest of the bridge alignment at its closest point. This is also associated with the potable Thames Water abstraction at Play Hatch.</p> <p>The SPZ boundaries in the vicinity of the site are marked on Figure 2.</p>

## 4.2 Assessment of Importance of Receptor

Several important groundwater receptors have been identified within close proximity to the proposed route. The assessment of groundwater receptors was carried out in accordance with the Highway Agency's Road Drainage and the Water Environment – Environmental Assessment Techniques (Volume 11, Section 3, Annex 4, Table 4.3). The main groundwater receptors are listed in the table below.

Table 4.2 Summary of Groundwater Receptors

Receptor	Details
Alluvium	The Alluvium is classified as a Secondary A aquifer. Given the limited thickness of the alluvial deposits, as indicated in the historical BGS borehole records, it likely that no registered groundwater abstractions are targeting the Alluvium.

Receptor	Details
	<p>The importance of the Alluvium as a groundwater receptor is assessed as <b>Medium</b>.</p>
Langley Silt Member	<p>The Langley Silt Member is classified as Unproductive Strata. The importance of this groundwater receptor is assessed to be <b>Low</b>.</p>
Kempton Park Gravel Formation	<p>The Kempton Park Gravel is classified as a Secondary A aquifer. The available environmental records indicate that the registered groundwater abstractions targeting the Kempton Park Gravel Formation are generally limited to agricultural and industrial usage. It is also expected that the gravels are providing a base flow to the River Thames. The importance of this groundwater receptor is assessed as <b>High</b> because it is expected to provide base flow to the River Thames ecosystem.</p>
Seaford and Newhaven Chalk Formation	<p>The Seaford and Newhaven Chalk Formation is classified as Principal Aquifer. The environmental data indicates that the proposed route is located within an area classified as a SPZ 2 and SPZ 3, and it is expected that the Chalk aquifer is providing significant base flow to River Thames. Groundwater is abstracted locally for potable use approximately 1km to the northeast of the proposed bridge alignment. It is considered that there may be a potential for the groundwater flow downgradient of the proposed route to be within the radius of influence of the abstraction well, The importance of this groundwater receptor is assessed as <b>High</b>.</p>

### 4.3 Appraisal of Significance of Impacts

The southern parts of the proposed bridge route are underlain by a historical landfill (Thames Valley Park Landfill). The landfill comprises former gravel pits infilled with PFA in the 1980s that had been removed during the earlier development of the Thames Valley Business Park during its construction. The landfill cells are reported to be clay lined (with reworked locally derived alluvium) to protect the surrounding environment, and in particular the River Thames from the migration of potential contaminating leachate resulting from the PFA. The historical landfill site therefore represents a significant environmental constraint to the proposed route and hazard to the identified controlled water receptors.

Without mitigation, the proposed bridge alignment over the River Thames over the landfill area could have the potential to have an adverse impact on the identified groundwater receptors, given that it is noted that the underlying and surrounding Kempton Park Gravel is likely to be in hydraulic continuity with the Chalk aquifer. This is considered to represent a potential Moderate to Major Adverse impact on controlled waters.

Careful design considerations will be required to ensure that the proposed bridge foundation solution does not affect the integrity of the landfill capping, and basal lining and result in preferential contamination pathway between the landfill and the underlying superficial strata. With careful design mitigation this could be reduced to Minor Adverse to Negligible impact resulting in a Neutral or Slight/Moderate significance of potential effect. Guidance regarding methods of piling that allow minimising groundwater disturbance and reducing the potential risk of contamination, are given in the EA 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention' (2001) and 'Piling in Layered Ground' (2006). Early discussions with the Statutory Regulators should be made to discuss and agree the method of construction and any proposed mitigation.

The historical landfill site is also considered to present a geotechnical risk. The presence of potential voids associated with poorly consolidated infilling; and the total or differential settlement of compressible waste materials, may represent a potential ground stability hazard to the proposed bridge alignment. Sudden collapses or landfill settlement caused by the consolidation of waste materials may occur across the former landfill area. Attention is also drawn to any existing permitting or planning permissions associated with the landfill that may represent a potential constraint to the proposed scheme.

Table 4.3 Summary of Magnitude of Impact on Groundwater Receptors after Mitigation and Significance of Potential Effects

Receptor	Importance of Receptor	Magnitude of Impact After Mitigation	Significance of Potential Effects After Mitigation
Alluvium	Medium	Negligible	Neutral
Langley Silt Member	Low	Negligible	Neutral
Kempton Park Gravel	High	Minor Adverse	Neutral
Seaford and Newhaven Chalk Formation	High	Minor Adverse	Slight/Moderate

## 5 Surface Water Receptors

### 5.1 Controlled Waters - Surface Water

The following table summarises the information recorded in the available environmental data regarding surface water receptors.

Table 5.1 Summary of Surface Water Related Information

Item	Description
Name	<p>Several waterbodies are present within close proximity to the proposed route alignment. These are summarised as follows:</p> <ul style="list-style-type: none"> <li>- River Thames. The River Thames is located within the study area beneath the route of the proposed new bridge alignment and flows west to east.</li> <li>- Several interconnected waterbodies known as the Caversham Lakes (flooded gravel pits) are located beneath the route of the proposed bridge alignment. With the exception of the Thames and Kennet Marina, the Caversham Lakes waterbodies that underlie the proposed route are not directly connected by surface water courses to the River Thames.</li> <li>- Berry Brook is also located beneath the northern extent of the proposed bridge alignment. Berry Brook flows in a north-easterly direction.</li> </ul>
Quality	<p>EA water quality data for the Thames and South Chilterns area indicates that the River Thames (Reading to Cookham) is of ecological status 'Moderate' and has a chemical status recorded as 'good' and Priority Substance Status 'good'.</p> <p>Water Quality data has been provided by the EA for Sonning Eye Lake which are part of the eastern extent of Caversham Lakes and linked to the waterbodies that underlie the proposed new bridge route. The sampling point is located around 1km to the northwest of the proposed bridge route. EA water quality data indicates that Sonning Eye Lake is generally of ecological status 'Good' and has a chemical status recorded as 'good' and Priority Substance Status 'good'</p>

	No Water Quality data is available for Berry Brook.
Surface Water Abstraction (radius 1km)	<p>According to the information provided by the Environment Agency and that present on their website, there are five surface water abstraction points within a 1km radius of the study area.</p> <p>The abstraction licences are all registered to the same operator, namely the Trustees of Phillimore Farms under Licence Number 28/39/23/0038. The abstraction licence is for an abstraction volume of 45460m<sup>3</sup>.</p> <p>The closest abstraction point is situated approximately 700m to the east of the proposed route with water abstracted from Thames Surface Water (Caversham Lakes). The abstraction is reportedly used for general agriculture spray irrigation. The surface water abstraction points within 1km of the proposed alignment are marked on Figure 2.</p>
Substantiated Pollution Incidents (land and water)	<p>A number of substantiated pollution incidents are recorded having occurred along the proposed route and in the adjacent area. These incidents are mostly associated with fly-tipping of Household, Commercial and Inert waste and resulted in Category 3 (Minor) impacts to land.</p> <p>The most recent pollution incident occurred in June 2005 along the proposed route and resulted in a Category 3 (Minor) impact to land. The incident was associated with illegal dumping of household waste.</p>
Discharge Consents (within 500m)	One discharge consent is recorded within 500m of the proposed bridge alignment. The discharge consent is located approximately 460m to the south of the proposed route and is associated with a domestic property.

## 5.2 Assessment of Importance of Receptor

The River Thames is an important Primary River within the Thames Catchment. The assessment of surface water receptors was carried out in accordance with the Highway Agency's Road Drainage and the Water Environment – Environmental Assessment Techniques (Volume 11, Section 3, Annex 4, Table 4.3). The main surface water receptors are listed in the table below.

Table 5.2 Summary of Surface Water Receptors

Receptor	Details
River Thames	<p>The River Thames is classified with ecological status 'Moderate' and chemical status 'Good'.</p> <p>The importance of this surface water receptor is assessed as <b>High</b>.</p>
Sonning Eye Lake	<p>The Sonning Eye lake is classified with ecological status 'Good' and chemical status 'Good'.</p> <p>The importance of this surface water receptor is assessed as <b>High</b>.</p>
Berry Brook	<p>No information could be obtained on the ecological and chemical status of Berry Brook.</p> <p>In the absence of water quality data, the importance of this surface water receptor is assessed as <b>High</b> similarly to other water bodies in the vicinity.</p>

### 5.3 Appraisal of Significance of Impacts

The River Thames is located adjacent to the Thames Valley Park landfill site which is considered to represent a potential significant environmental hazard to surface water receptors. It is noted that both the Kempton Park Gravel and the Chalk aquifers are likely to be in hydraulic continuity with the River Thames, and they are expected to be providing an important base flow to the river.

In addition to the hazards associated with the landfill there is a potential for the severance of the on-site channels streams and ditches in conjunction with the proposed river crossing. Careful design mitigation will be needed to ensure that any approach embankments do not sterilise or cut-off any such surface water features.

The proposed bridge alignment over the River Thames has the potential to cause an impact on the identified surface water receptors. Without mitigation the proposed alignment is considered to present a potential Moderate to Major Adverse impact on the surface water receptors due to the potential negative effect on water quality following development.

There is considered to be a Large/Very Large potential effect on surface water that could arise as a result of poor construction practices or a breach in the integrity of the landfill capping/liner. However, with careful design mitigation and good construction practices, the potential impact could be reduced to Minor Adverse resulting in a Slight/Moderate significance of potential effect.

It is recommended that careful design considerations are given to ensure that the proposed bridge foundation solution does not affect the integrity of the landfill lining and result in

preferential contamination pathway to the groundwater receptors and subsequently to the River Thames. Early discussions with the Statutory Regulators should be made to discuss and agree the method of construction and any proposed mitigation

The northern section of the proposed bridge is located within an area comprising flooded gravel pits. These waterbodies are directly linked to Sonning Eye Lake and consideration will need to be given to reduce potential adverse impacts of the proposed development on these waterbodies. Careful design mitigation may allow reducing the impact to Minor Adverse or Negligible, resulting in a Neutral or Slight/Moderate Adverse significance of potential effect.

Table 5.3 Summary of Magnitude of Impact on Groundwater Receptors after Mitigation and Significance of Potential Effects

<b>Receptor</b>	<b>Importance of Receptor</b>	<b>Magnitude of Impact After Mitigation</b>	<b>Significance of Potential Effects After Mitigation</b>
River Thames	<b>High</b>	<b>Minor Adverse</b>	<b>Slight/Moderate</b>
Sonning Eye Lake	<b>High</b>	<b>Minor Adverse to Negligible</b>	<b>Slight/Moderate to Neutral</b>
Berry Brook	<b>High</b>	<b>Minor Adverse to Negligible</b>	<b>Slight/Moderate to Neutral</b>

In addition to the hazards posed by the landfill that underlies the proposed route, there are operational and construction related hazards that could detrimentally affect the nearby underlying groundwater and surface water receptors. For example, there could be spillages and discharges associated with the plant and machinery used during the construction phase of the bridge. Additionally, the construction activities may lead to an increase in river water turbidity and sediment entrainment that can have a negative ecological impact on the river environment. The adoption of good construction practices; design and mitigation measures can largely eliminate this hazard and would result in a neutral significance of potential effect following their implementation.

## 6 Conclusions and Recommendations

The assessment report has appraised the potential impact of the proposed development on the surface water and groundwater receptors in the vicinity of the proposed bridge alignment.

The proposed bridge alignment is situated between the A4155/Henley Road and Thames Valley Park drive, with the route crossing over the Caversham Lakes area and River Thames. The study has identified the presence of an engineered and restored landfill on the southern extent of the proposed bridge alignment.

The proposed route lies within an area that is underlain and in the vicinity of high sensitivity controlled water receptors. The assessment has identified River Thames and Sonning Eye Lakes represent high sensitivity surface water receptors which are classified with a 'Good' ecological or chemical status under the Water Framework Directive. Part of the northern extent of the proposed route also lies within a SPZ 3 (Total Catchment) and SPZ2 (Outer Zone) associated with a potable groundwater abstraction located 570m to the northeast of the proposed route. The main productive aquifer is the Seaford and Newhaven Chalk Group which has been classified as a high sensitivity receptor due to its importance locally as a groundwater resource. Additional receptors of potentially high sensitivity include the Berry Brook and the superficial Kempton Park Gravel Formation.

The landfill and its proximity to adjacent high sensitivity controlled waters is considered to be a noteworthy environmental constraint. This is considered to represent a Moderate to Major Adverse impact to both surface water and groundwater receptors, but with careful design mitigation could be reduced to a Minor Adverse or Negligible impact resulting in a Neutral or Slight/Moderate significance of potential effect.

It should also be highlighted that the landfill may also present; geotechnical, permitting and planning constraints to the proposed scheme.

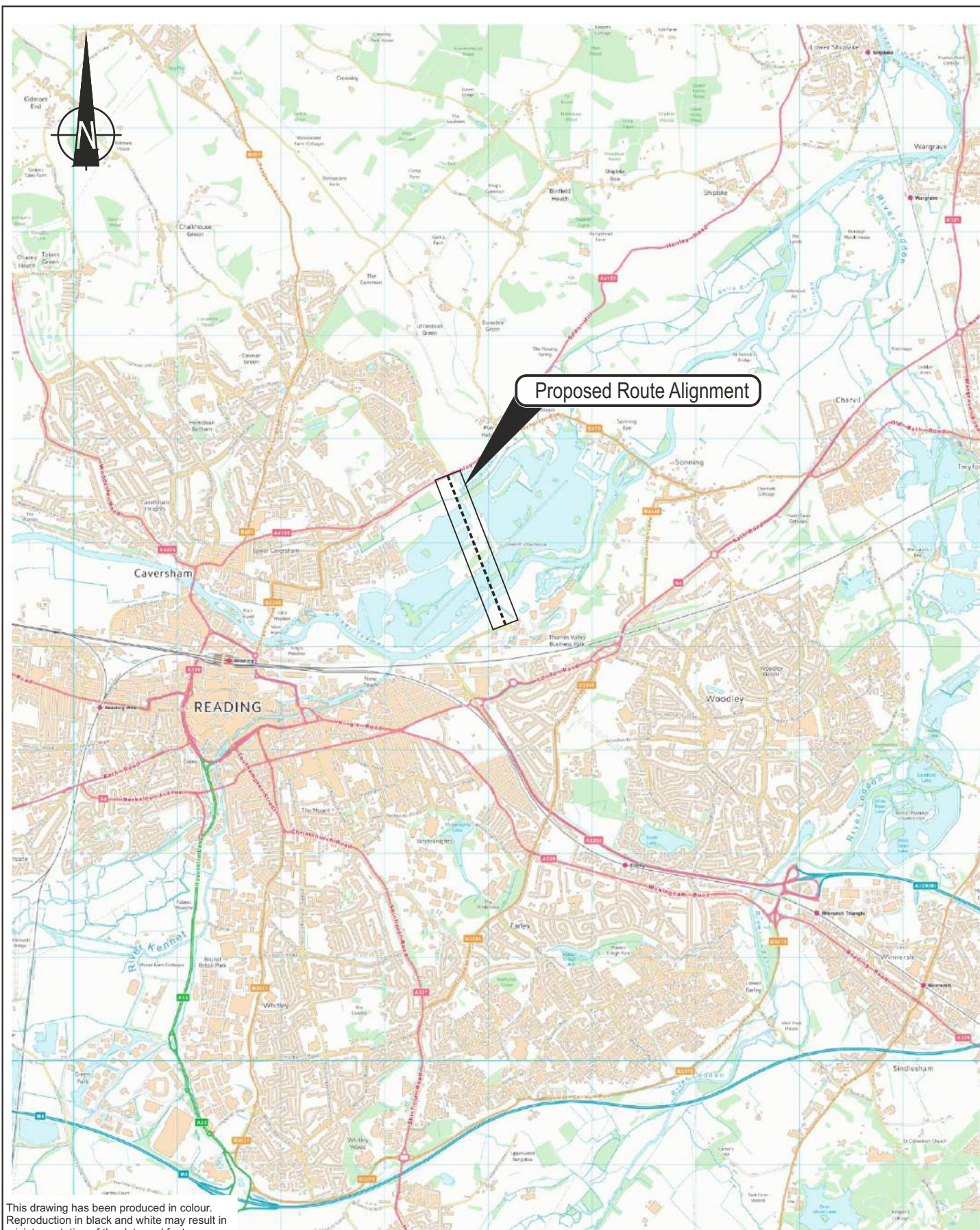
Remaining risks to controlled waters such as from spillages or discharges during construction or operational phase are likely to pose Minor adverse impacts, that with careful planning, mitigation and good construction practices could be reduced to a Neutral significance of potential effect.

Careful design considerations will be required to ensure the proposed bridge foundation solution does not affect the integrity of the landfill capping and basal lining and result in a preferential contamination pathway between this and the underlying groundwater that is in direct continuity with the River Thames. Early discussions with the Statutory Regulators should be made to discuss and agree the method of construction and any proposed mitigation

Given the context set out above, significant consideration ought to be given to the water environment as part of the development of a new road bridge at the proposed location in order to inform any construction processes and include suitable mitigation embedded within the design.

## 7 Figures

Figure 1 – Site Location Plan



This drawing has been produced in colour. Reproduction in black and white may result in misinterpretation of the data and features being presented.

Grid Ref: SU 741 749

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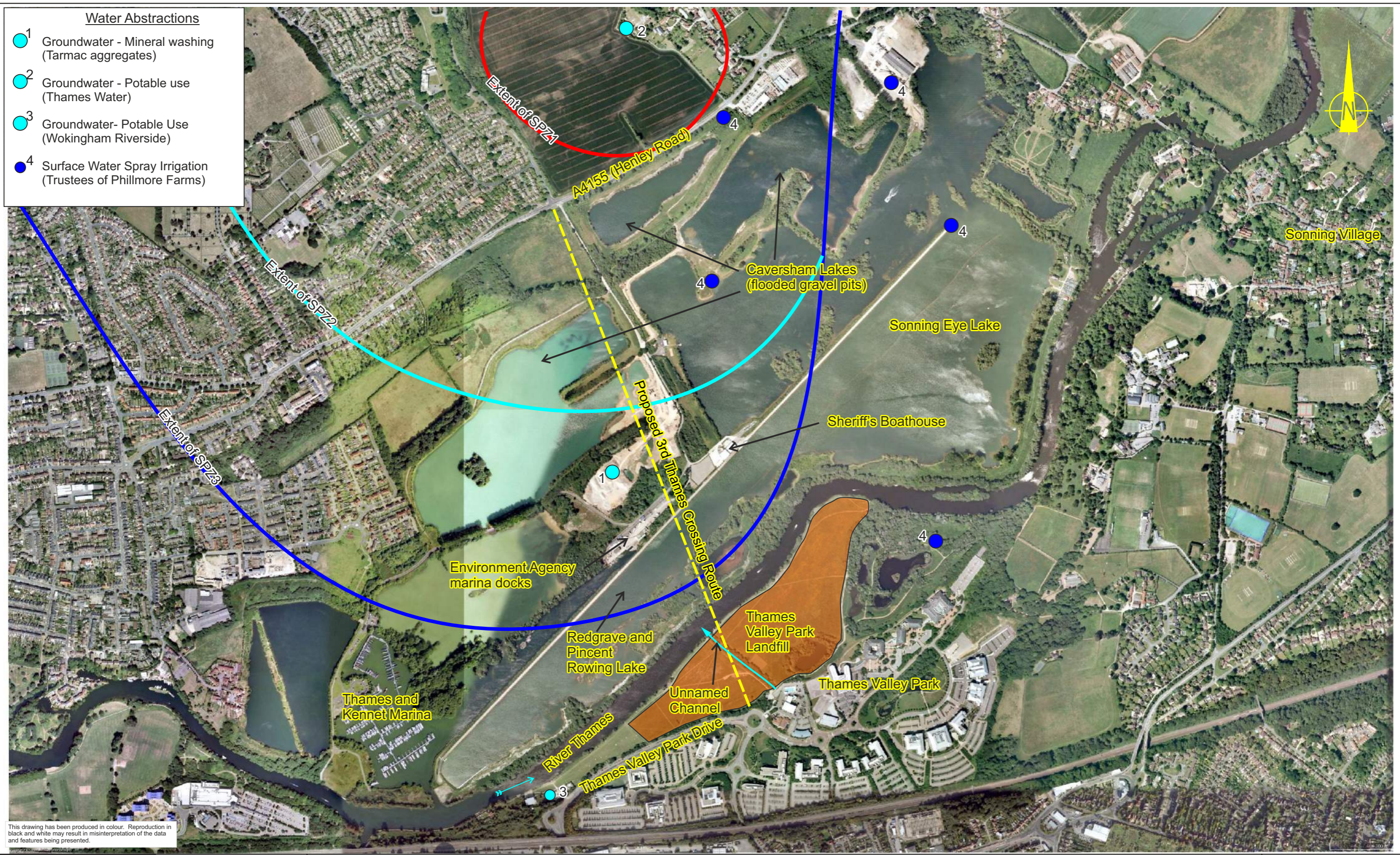
Contains Ordnance Survey data © Crown copyright and database right 2015.

**THAMES 3RD CROSSING**  
**PROPOSED ROUTE ALIGNMENT  
 LOCATION**

Date	25.07.2016
A4 Scale	1:50 000
Drawn by	davco
Checked by	FT
Revision	0

**FIGURE 1**

Figure 2 - Proposed Route Layout and Constraints Plan



This drawing has been produced in colour. Reproduction in black and white may result in misinterpretation of the data and features being presented.

Offices throughout the UK and continental Europe.  
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Client  
**WOKINGHAM BOROUGH COUNCIL**

Google Earth  
© 2016 Infoterra Ltd & Bluesky  
Image © 2016 The GeoInformation Group  
Image Date: May 2009

THAMES 3RD CROSSING  
PROPOSED ROUTE LAYOUT PLAN AND CONSTRAINTS PLAN

Date	25.07.2016
A3 Scale	1:10 000
Drawn by	davco
Checked by	FT
Revision	0

**FIGURE 2**

**Annex A      Site walkover photographs**

Plate 1: Overview of the southern River Thames bank across the historical landfill area.



Plate 2: Overview of River Thames from the southern bank.




	Client	<b>SITE WALKOVER PHOTOGRAPHS</b>	Date	August 2016
	<b>Wokingham Borough Council</b>		A4 Scale	nts
			Drawn	FT
			Checked	JG
			Appendix	2
Caversham Bridge House, Waterman Place, Reading, RG1 8DN Tel 0118 950 0761 Fax 0118 959 7498				

Plate 3: Unnamed stream crossing the proposed route on the southern bank of River Thames.



Plate 4: Overview of the historical landfill site from the west.



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Tel 0118 950 0761 Fax 0118 959 7498

Client  
**Wokingham  
Borough Council**

**SITE WALKOVER  
PHOTOGRAPHS**

Date	August 2016
A4 Scale	nts
Drawn	FT
Checked	JG
Appendix	2

Plate 5: Pond located to the southeast of the proposed bridge alignment.



Plate 6: Agricultural pasture land adjacent to the A4155 on the northern extent of the proposed route.



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**Wokingham  
Borough Council**

**SITE WALKOVER  
PHOTOGRAPHS**

Date	August 2016
A4 Scale	nts
Drawn	FT
Checked	JG

Appendix

Plate 7: Overview of the unnamed road along the northern extent of the proposed alignment.



Plate 8: Environment Agency 'Caversham Lakes Site' compound adjacent to the proposed route.



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**SITE WALKOVER  
PHOTOGRAPHS**

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A4 Scale	nts
Drawn	FT
Checked	JG
Appendix	2

Plate 9: Overview of a restored gravel pit adjacent to the west to the proposed alignment.



Plate 10: Partially flooded gravel pit adjacent to the northwest to the proposed bridge alignment.



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Borough Council**

**SITE WALKOVER  
PHOTOGRAPHS**

Date	August 2016
A4 Scale	nts
Drawn	FT
Checked	JG

Appendix	2
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# **Annex B      BGS Exploratory Hole Records**

Institute of Geological Sciences  
 MINERAL ASSESSMENT UNIT

Sand and Gravel Survey  
 BOREHOLE RECORD SHEET

Borehole Reg. No. **SU 77 SW 13**  
 Nat. Grid Ref. **7354 7487**  
 Locality **Nr. Henley Road: East of Caversham**  
 Date started **7<sup>th</sup> December 1972**  
 Date finished **7<sup>th</sup> December 1972**  
 Recorded by **C. E. CORSER**

Drilled by **Sonclaires**  
 Drill type **Percussion**  
 Hole diameter **152 mm**  
 Surface level ft. OD  
 Water struck at **1.6 m** below surface  
 Water struck at ft. OD  
 Depth(s) bailed  
 Mean grading percentages  
 Fines Sand Gravel

Classification of ground	Thickness m	Nature
<b>Ooberburden</b>	<b>0.7</b>	<b>Soil on Sandy Clay</b>
<b>Mineral</b>	<b>7.7</b>	<b>Sand and Gravel</b>
<b>Bedrock</b>	<b>0.5 +</b>	<b>Chalk</b>
	<b>8.9</b>	

Remarks  


Description of Strata	Thickness m	Depth to base m	Sample Nos.
<b>Topsoil</b>	<b>0.3</b>	<b>0.3</b>	
<b>Sandy Clay: light brown with occasional pebble</b>	<b>0.4</b>	<b>0.7</b>	<b>Not Sampled</b>
<b>River Valley Gravel:</b> <b>Sand and Gravel</b> all samples essentially the same <b>Sand: medium and coarse with some fine: flint and quartz. light brown.</b> <b>Gravel: medium: brown, red-brown and black flint with quartz and quartzite and occasional chalk pebbles</b>	<b>1.0</b>	<b>1.7</b>	<b>MT1297</b>
	<b>1.0</b>	<b>2.7</b>	<b>MT1298</b>
	<b>1.0</b>	<b>3.7</b>	<b>MT1299</b>
	<b>1.0</b>	<b>4.7</b>	<b>MT1300</b>
	<b>1.0</b>	<b>5.7</b>	<b>MT1301</b>
	<b>1.0</b>	<b>6.7</b>	<b>MT1302</b>
	<b>1.0</b>	<b>7.7</b>	<b>MT1303</b>
	<b>0.7</b>	<b>8.4</b>	<b>MT1304</b>

Ooberburden -  
 Mineral

Description of Strata (cont.)	Thickness m	Depth to base m	Sample Nos.
Mineral	some black cobble flint throughout: appears to get coarser with depth chalk pebbles occur from 1.9m downwards: MT 1297 more sandy with finer gravel. MT 1304 overlying the bedrock contains a fair amount of chalk		
Bedrock	Chalk	0.5+	8.9
/			

Sample Depths			No Special Samples.
Sample No.	Depth interval m	Remarks	
MT 1297	} 7.7 m Mineral Sand + Gravel.		
MT 1298			
MT 1299			
MT 1300			
MT 1301			
MT 1302			
MT 1303			
MT 1304			





BGS ID: 427951 : BGS Reference: SU77NW142

British National Grid (27700) : 474230,17572

British Geological Survey		British Geological Survey		British Geological Survey	
<b>SOMMING BYE EXPLORATION BOREHOLE</b>				SU 77/145 NW 142	
Owner <b>BSR MELORNE EXPLORATION</b>		Licence No.		Nat. Grid Ref. <b>7423 7572</b>	
Occupier		IGS Ref. No.		Status <b>Exploration BH. For Hydrocarbons F</b>	
Ground Level		m OD		ft. OD	
Level of Well Top		m OD		ft. OD	
Rest Water Level		m bwt		ft. bwt	
(Date <b>MARCH 14</b> )		m OD		ft. OD	
Construction		<b>B</b>		Summary of Geological Section	
Depth bwt		Dia.		Thickness	
				Depth	
		Lining (below well top)			
		From To Dia. Type			
<b>137.0 M</b>		<b>0 61</b>		<b>FLINT GRAVEL</b>	
<b>c. 250 mm</b>		<b>150 mm</b>		<b>12.2 m 12.2 m</b>	
				<b>U. CHALK</b>	
				<b>61.0 73.2</b>	
				<b>M. CHALK</b>	
				<b>63.8 137.0</b>	
				<b>L. CHALK</b>	
				<b>64.5 201.5</b>	
				<b>UPPER GREENSAND</b>	
				<b>22.5 224.0</b>	
				<b>GAULT</b>	
				<b>102.5 326.5</b>	
				<b>LOWER GREENSAND</b>	
				<b>7.5 334</b>	
				<b>KIMMERIDGE CLAY</b>	
				<b>COAL MEASURES</b>	
				<b>(2.5 m COAL SEAM</b>	
				<b>AT 415 m )</b>	
Abstraction Rates		Type of Pump		BASE HOLE U. DEVONIAN	
gph		Chem./Bact. Anal. YES NO			
gpd		Well Driller <b>KENTING PETROLEUM</b>		<b>1370</b>	

If insufficient space has been allowed, continue in 'Notes' overleaf.

Institute of Geological Sciences  
MINERAL ASSESSMENT UNIT

Sand and Gravel Survey  
BOREHOLE RECORD SHEET

Borehole Reg. No. **SU 77 SW 14**  
 Nat. Grid Ref. **7395, 7429**  
 Locality **Nr Casement Factory: East of Reading**  
 Date started **8<sup>th</sup> December 1972**  
 Date finished **11<sup>th</sup> December 1972**  
 Recorded by **C. E. CORSER**

Drilled by <b>Sonclaires</b> Drill type <b>Percussion</b> Hole diameter <b>152 mm</b> Surface level           ft.           OD Water struck at <b>1.0</b> m below surface Water struck at           ft.           OD Depth(s) bailed Mean grading percentages Fines           Sand           Gravel	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 33%;">Classification of ground</th> <th style="width: 33%;">Thickness m</th> <th style="width: 34%;">Nature</th> </tr> <tr> <td>Overburden</td> <td>1.0</td> <td rowspan="2">Soil on Alluvial clay pits (+ rubble?)</td> </tr> <tr> <td>Mineral (Clay parting 10cm)</td> <td>8.2</td> </tr> <tr> <td>Bedrock</td> <td>0.1</td> <td rowspan="2">Sand + Gravel</td> </tr> <tr> <td></td> <td>0.5 +</td> </tr> <tr> <td></td> <td>9.8</td> <td>Chalk</td> </tr> </table>	Classification of ground	Thickness m	Nature	Overburden	1.0	Soil on Alluvial clay pits (+ rubble?)	Mineral (Clay parting 10cm)	8.2	Bedrock	0.1	Sand + Gravel		0.5 +		9.8	Chalk
Classification of ground	Thickness m	Nature															
Overburden	1.0	Soil on Alluvial clay pits (+ rubble?)															
Mineral (Clay parting 10cm)	8.2																
Bedrock	0.1	Sand + Gravel															
	0.5 +																
	9.8	Chalk															

Remarks *As this borehole is very close to the Thames and Kennet River junction, might there just be a possibility that the clay parting separates two horizons of gravel originating from different sources areas. I suggest that the lower 3.6m with less quartz and quartzite is of Kennet valley origin, later the Thames predominated depositing 4.6m of gravel of a more varied composition.*

Description of Strata		Thickness m	Depth to base m	Sample Nos.
1	<b>Topsoil</b>	0.2	0.2	/
1	Overburden			
1	Alluvium			
	"Subsoil" (?) light-brown vaguely mottled clay with rare fine gravel (and shells?) Silty.	0.6	0.8	/
	Clay: light brown with some gravel, fine white flint Silty overall.	0.2	1.0	/
1	Mineral			
1	Sand and / with Gravel			
	<b>River Valley Gravel</b>			
	fine to coarse gravel	1.0	2.0	MT1305
	more quartz and quartzite	1.0	3.0	MT1306
	greater size-range	1.0	4.0	MT1307
	more cobbles	1.0	5.0	MT1308
	Sand to gravel ratio + silty	0.6	5.6	MT1309
	CLAY BAND 5.6 - 5.7m			
	fine and medium with coarse gravel	1.0	6.7	MT1310
	less quartz and quartzite	1.0	7.7	MT1311
	less cobbles	1.0	8.7	MT1312
	more sand than gravel and sand finer	0.6	9.3	MT1313

Description of Strata (cont.)	Thickness m	Depth to base m	Sample Nos.
<p><u>Sand and/w/ith gravel (overall)</u></p> <p><u>Gravel</u>: fine to coarse with occasional cobbles Essentially flint: s2 to 5A. Quartzite and quartz white to brown wR to 5A predominate in upper 4-6 m Occasional sandstone and chalk pebbles Cobbles scattered throughout, more numerous in upper 4-6 m</p> <p><u>Sand</u>: fine to medium, light brown: fine sand predominates in lower 3-6 m</p> <p><u>Clay parting</u> 10cm between 5.6-5.7m. gravelless, fine, faintly mottled.</p>			

<p>Chalk</p> <p>(as mapped)</p>	0.5+	0.8	/
---------------------------------	------	-----	---

Sample Depths		
Sample No.	Depth Interval m	Remarks
MT1305	1.0	<p>8.2 m of <u>Excellent Sand</u> <u>+ Gravel</u></p>
MT1306	1.0	
MT1307	1.0	
MT1308	1.0	
MT1309	0.6	
MT1310	1.0	
MT1311	1.0	
MT1312	1.0	
MT1313	0.6	
<p><u>No Special Samples</u></p>		

BGS ID: 428769 : BGS Reference: SU77SW617

British National Grid (27700) : 474180,174183

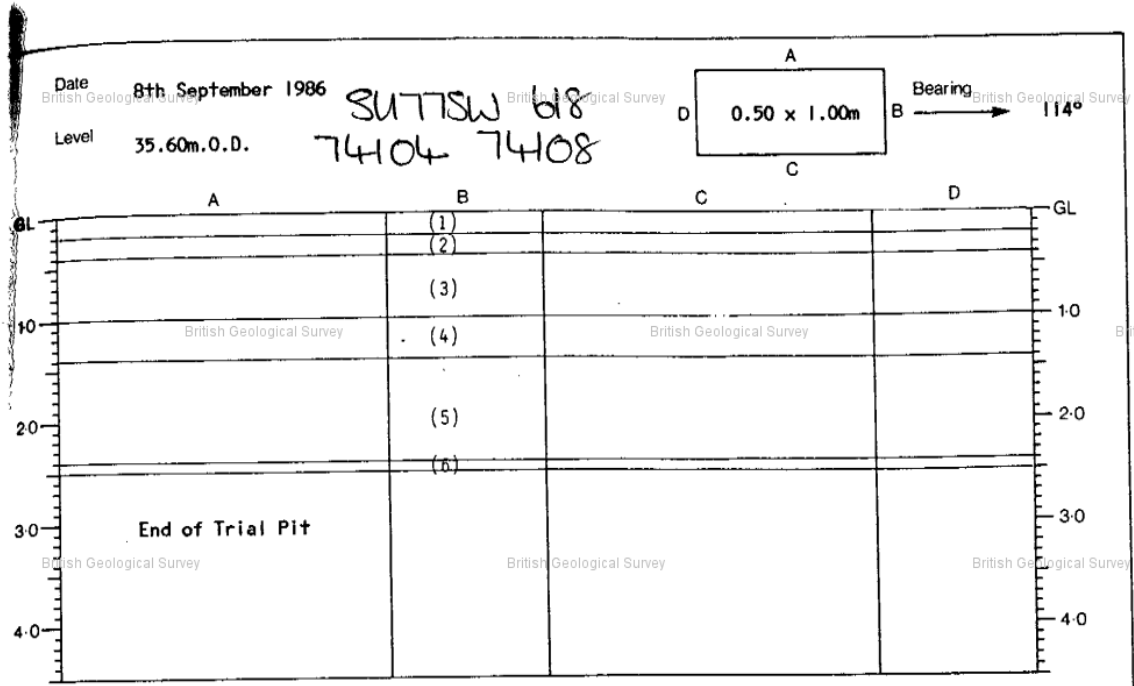
Date **8th September 1986**  
 Level **35.86m. O.D.**  
**SU77SW 617**  
**74180 74183**

A  
 0.50 x 1.50m  
 B Bearing  $\rightarrow$  **110°**

A	B	C	D
GL	(1)		GL
	(2)		
1.0	(3)		1.0
2.0			2.0
3.0	<b>End of Trial Pit</b>		3.0
4.0			4.0

Samples		Strata		Test Depth m.	Cu kN/m <sup>2</sup>	Remarks
Depth	Type	No.	Description			
		1	TOPSOIL.			
0.40	D	2	Firm brown slightly sandy silty CLAY with rootlets becoming sandy with depth. (Alluvium)			
1.00	B	3	Brown grey and white very coarse sandy fine to coarse sub-angular flint and sub-rounded chalk GRAVEL with coarse sand bands/lenses. (Valley Gravel)			

Plant	JCB 3CX	Water	0.95m Fast ingress	Cu-Approximate value of un-drained shear strength from hand vane
Shored to		Stability	Collapsing in gravels on all four sides	
<b>Trial Pit Record</b>		<b>Project</b>		Contract <b>E6043</b>
<b>exploration associates</b>		A329(M) Broken Brow and North Earley Link Royal County of Berkshire		Trial Pit <b>10</b>



Depth		Strata		Test Depth m.	Cu kN/m <sup>2</sup>	Remarks
Depth	Type	No.	Description			
10	D	1	Spongy fibrous PEAT with well developed marsh grass.			
40	D	2	Firm blue grey and orange brown occasionally fissured silty CLAY with many rootlets. (Alluvium)			
70	BD	3	Soft blue grey silty CLAY with occasional fine to coarse sub-rounded gravel. (Alluvium)			
.20	D	4	Very soft light brown and orange brown fine sandy clayey SILT becoming sandy with depth. (Alluvium)			
.60	D	5	Light brown and white fine gravelly coarse SAND with the basal 200mm of laminated fine sandy SILT. (Alluvium)			
		6	Brown grey and white coarse sandy fine to coarse sub-angular flint and sub-rounded chalk GRAVEL. (Valley Gravel)			
Plant		JCB 3CX	Water	Surface seepage 0.20m fast ingress 1.40m		Cu-Approximate value of un-drained shear strength from hand vane
Shored to			Stability	Collapsing in sands on all four sides		
<b>Trial Pit Record</b>				<b>Project</b>		Contract E6043
<b>exploration associates</b>				A329(M) Broken Brow and North Earley Link Royal County of Berkshire		Trial Pit 11

SU77SW 602  
73967 74147

Drilling		Properties			Strata		Depth	Level	Legend		
Type	Cu kPa	W%	SPT N	Description							
				TOPSOIL			G.L.	35.65			
D CB		45	4	Soft brown mottled dark brown and greenish grey very silty sandy clay with rare gravel			0.30	35.35			
D/W CB		28	15	Medium dense light yellowish brown clayey very sandy SILT with rare fine chalk fragments			1.30	34.35			
D CB			15	Medium dense brown and grey slightly silty very sandy fine medium and coarse flint GRAVEL			2.50	33.15			
D CB			18								
D CB			22								
				End of Borehole			5.00	30.65			
<b>Drilling</b>					<b>Ground Water</b>						
Type	From	To	Size	Fluid	Struck	Behaviour	Sealed	Date	Hole	Cased	Water
Shell and luger	G.L.	5.05	0.15	-	2.50	Rose quickly to 1.2m		11.9.86	5.05	5.00	2.20
<b>Remarks</b> Piezometer installed; tip at 4.1m; sand filter 3.3m - 4.3m											
<b>Borehole Record</b>					<b>Project</b>			<b>Contract</b>			
exploration associates					A329(M) Broken Brow and North Earley Link Royal County of Berkshire			E6043			
								<b>Borehole</b> 11 Sheet 1 of 1			

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Sand and Gravel Survey

BOREHOLE RECORD SHEET

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 Date finished **11<sup>th</sup> December 1972**  
 Recorded by **C. E. CORSER**

Drilled by <b>Sondalores</b> Drill type <b>Percussion</b> Hole diameter <b>152 mm</b> Surface level                      ft.                      OD Water struck at <b>1.0</b> m below surface Water struck at                      ft.                      OD Depth(s) bailed Mean grading percentages Fines                      Sand                      Gravel	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Classification of ground</th> <th style="width: 33%;">Thickness m</th> <th style="width: 33%;">Nature</th> </tr> </thead> <tbody> <tr> <td>Overburden</td> <td>1.0</td> <td rowspan="2">Soil on Alluvial clay pits (+ subsoil)</td> </tr> <tr> <td>Mineral (Clay parting) 10cm</td> <td>8.2</td> </tr> <tr> <td>Beclrock</td> <td>0.5 +</td> <td>chalk</td> </tr> <tr> <td></td> <td><b>9.8</b></td> <td></td> </tr> </tbody> </table>	Classification of ground	Thickness m	Nature	Overburden	1.0	Soil on Alluvial clay pits (+ subsoil)	Mineral (Clay parting) 10cm	8.2	Beclrock	0.5 +	chalk		<b>9.8</b>	
Classification of ground	Thickness m	Nature													
Overburden	1.0	Soil on Alluvial clay pits (+ subsoil)													
Mineral (Clay parting) 10cm	8.2														
Beclrock	0.5 +	chalk													
	<b>9.8</b>														

Remarks *As this borehole is very close to the Thames and Kennet River junction, might there just be a possibility that the clay parting separates two horizons of gravel originating from different sources areas. I suggest that the lower 5.6m with less quartz and quartzite is of Kennet valley origin, later the Thames predominated depositing 4.6m of gravel of a more varied composition.*

Description of Strata	Thickness m	Depth to base m	Sample Nos.
- Topsoil	0.2	0.2	/
- "Subsoil: (P) light-brown vaguely mottled clay with rare fine gravel (and shells?) Silty:	0.6	0.8	/
- Alluvium Clay: light brown with some gravel, fine white flint Silty overall:	0.2	1.0	/
- Mineral Sand and / with Gravel <u>River Valley Gravel</u>			
<i>fine to coarse gravel</i>	1.0	2.0	MT1305
<i>more quartz and quartzite</i>	1.0	3.0	MT1306
<i>greater size-range</i>	1.0	4.0	MT1307
<i>more cobbles</i>	1.0	5.0	MT1308
<i>Sand to gravel ratio = 50/50</i>	0.6	5.6	MT1309
CLAY BAND 5.6 - 5.7m			
<i>fine and medium with coarse gravel</i>	1.0	6.7	MT1310
<i>less quartz and quartzite</i>	1.0	7.7	MT1311
<i>less cobbles</i>	1.0	8.7	MT1312
<i>more sand than gravel and sand finer</i>	0.6	9.3	MT1313

Description of Strata (cont.)	Thickness m	Depth to base m	Sample Nos.
<p><u>Sand and/w/ith gravel (overall)</u></p> <p><u>Gravel</u>: fine to coarse with occasional cobbles Essentially flint: s2 to 5A. Quartzite and quartz white to brown or to 5A predominate in upper 4-6 m Occasional sandstone and chalk pebbles Cobbles scattered throughout, more numerous in upper 4-6 m</p> <p><u>Sand</u>: fine to medium, light brown: fine sand predominates in lower 3-6 m</p> <p><u>Clay parting</u> 10cm between 5.6-5.7m. gravelless, fine, faintly mottled.</p>			

<p>Chalk</p> <p>(as mapped)</p>	0.5+	0.8	/
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Sample Depths			
Sample No.	Depth Interval m	Remarks	
MT1305	1.0		<p><u>No Special Samples</u></p>
MT1306	1.0		
MT1307	1.0		
MT1308	1.0		
MT1309	0.6	8.2 m of	
MT1310	1.0	Excellent Sand	
MT1311	1.0	+ Gravel	
MT1312	1.0		
MT1313	0.6		

**Annex C Selected Extracts from Third-party Data**

ES/6/WD/BRK/101

ROYAL COUNTY OF BERKSHIRE

NOTICE OF THE GRANT OF A WASTE DISPOSAL LICENCE

CONTROL OF POLLUTION ACT 1974

THE CONTROL OF POLLUTION (LICENSING OF WASTE DISPOSAL) REGULATIONS 1976

THE LICENCE HOLDER: Thames Valley Park Ltd  
Osprey House  
Lower Square  
Old Isleworth  
Middlesex TW7 6BN

APPLICATION NO: 54/12/4/231

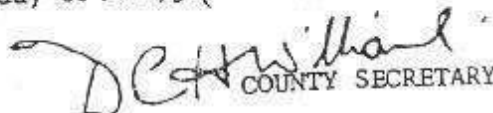
FACILITY: Landfill on land at the former CEGB  
Power Station, North Earley, Reading, within  
the area shown edged red on the location plan  
attached.

O.S. GRID REF: SU 744 745

NOTICE IS HEREBY GIVEN that the Berkshire County Council, the Waste Disposal Authority, has GRANTED a waste disposal licence for the above facility described in the above application subject to the conditions stated on the attached 2 No. of sheets in Appendix A.

The granting of a licence does not absolve the applicant from any requirement under the Health and Safety at Work etc Act 1974, the Radioactive Substances Act 1960, Control of Pollution (Special Waste) Regulations 1980, planning, building, water protection, environmental health legislation and general statutory provisions in force in the Administrative Area of the County Council.

Dated the 31<sup>st</sup> day of March 1983

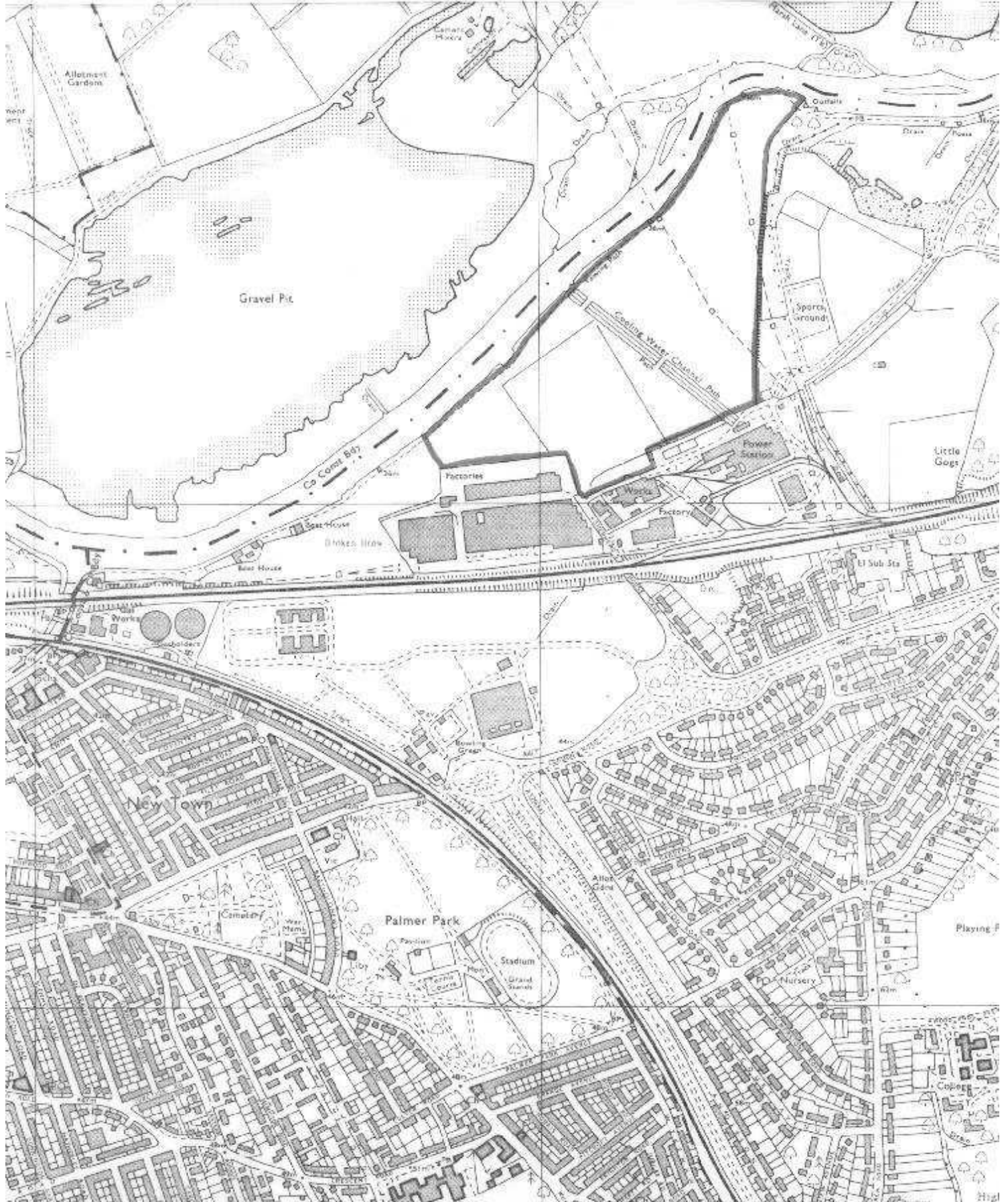
  
COUNTY SECRETARY

A statement of the Applicant's Rights of Appeal under Section 10 of the Control of Pollution Act 1974 is set out overleaf.

# Thames Valley Park, North Easley, Reading

## Location Plan

Scale 1:10,000



APPENDIX A.

CONDITIONS OF SITE LICENCE  
SITE: THAMES VALLEY PARK NORTH EARLEY READING  
APPLICATION NO: 54/12/4/231

1. For the purpose of this licence the site shall only be used for the disposal of pulverised fuel ash (P.F.A.), P.F.A. contaminated with low levels of asbestos and other waste materials removed during the realignment of the River Thames Flood Plain at North Earley, and inert materials excavated from within the site.

No other types of controlled waste whatsoever shall be accepted for disposal at the site.

2. Asbestos classified as Special Waste (Control of Pollution [Special Waste] Regulations 1980, as specified in Waste Management Paper 23) excavated as discrete pockets of asbestos fibre during the above flood plain realignment works, shall not be deposited at the site.
3. The waste shall only be deposited within the three specifically formed gravel excavations, Areas X, Y and Z as shown on Drawing 87/224/1A (attached hereto).
4. Infilling shall take place within dry banded areas prepared as specified in conditions 5 to 8 inclusive, to the sequence of operations illustrated in Drawing 87/224/2A (attached hereto).
5. Prior to infilling, each excavation shall be de-watered and a layer of in-situ gravel at least 0.5 metres thick shall be retained above the chalk.
6. Alluvial clay from within the site shall be selected, placed and compacted to the approval of the Waste Disposal Authority and Thames Water Authority on the base and against the sides of the excavation to provide a bund of minimum thickness 2 metres on all sides and a 0.5 metres thick layer on the base.
7. If sufficient alluvial clay is not present on site to meet the perimeter sealing specification in Condition 6, provided that a 2 metre thick bund is installed against the riverside wall, other bund walls shall be constructed to a design and thickness approved by the Waste Disposal Authority and Thames Water Authority. In such circumstances, bund walls on the eastern, down groundwater gradient side of any excavation shall not contain any impermeable synthetic liner.
8. A buffer zone of undisturbed gravel not less than 20 metres wide shall be established between the River Thames and the waste infill.
9. Once the infilling has reached final waste levels in each excavation area, the PFA shall be covered with a geotextile membrane, 0.5 metre thick layer of gravel and further geotextile membrane, followed by a capping layer of alluvial clay of minimum thickness 0.5 metres, keyed into the alluvial clay forming the walls of the deposit areas. The capping layer shall be selected, placed and compacted to the approval of the Waste Disposal Authority and Thames Water Authority.

## **Annex D      DMRB Volume II Section 3 - Reporting of Significance Potential Effects Tables**

Importance	Criteria	Typical Examples
Very High	Attribute has a high quality and rarity on regional or national scale	<b>Surface Water:</b> EC Designated Salmonid/Cyprinid fishery WFD Class 'High' Site protected/designated under EC or UK habitat legislation (SAC, SPA, SSSI, WPZ, Ramsar site, salmonid water)/ Species protected by EC legislation
		<b>Groundwater:</b> Principal aquifer providing a regionally important resource or supporting site protected under EC and UK habitat legislation SPZ1
		<b>Flood Risk:</b> Floodplain or defence protecting more than 100 residential properties from flooding
High	Attribute has a high quality and rarity on local scale	<b>Surface Water:</b> WFD Class 'Good' Major Cyprinid Fishery Species protected under EC or UK habitat legislation
		<b>Groundwater:</b> Principal aquifer providing locally important resource or supporting river ecosystem SPZ2
		<b>Flood Risk:</b> Floodplain or defence protecting between 1 and 100 residential properties or industrial premises from flooding
Medium	Attribute has a medium quality and rarity on local scale	<b>Surface Water:</b> WFD Class 'Moderate'
		<b>Groundwater:</b> Aquifer providing water for agricultural or industrial use with limited connection to surface water SPZ3
		<b>Flood Risk:</b> Floodplain or defence protecting 10 or fewer industrial properties from flooding
Low	Attribute has a low quality and rarity on local scale	<b>Surface Water:</b> WFD Class 'Poor'
		<b>Groundwater:</b> Unproductive strata
		<b>Flood Risk:</b> Floodplain with limited constraints and a low probability of flooding of residential and industrial properties

Table A4.3 – Estimating the Importance of Water Environment Attributes

Magnitude	Criteria	Typical Example
<b>Major Adverse</b>	Results in loss of attribute and/or quality and integrity of the attribute	<b>Surface Water:</b> Failure of <b>both</b> soluble and sediment-bound pollutants in HAWRAT (Method A, Annex I) <b>and</b> compliance failure with EQS values (Method B) Calculated risk of pollution from a spillage >2% annually (Spillage Risk Assessment, Method D, Annex I) Loss or extensive change to a fishery Loss or extensive change to a designated Nature Conservation Site
		<b>Groundwater:</b> Loss of, or extensive change to, an aquifer Potential high risk of pollution to groundwater from routine runoff – risk score >250 (Groundwater Assessment, Method C, Annex I) Calculated risk of pollution from spillages >2% annually (Spillage Risk Assessment, Method D, Annex I) Loss of, or extensive change to, groundwater supported designated wetlands
		<b>Flood Risk:</b> Increase in peak flood level (1% annual probability) >100 mm (Hydrological Assessment of Design Floods and Hydraulic Assessment, Methods E and F, Annex I)
<b>Moderate Adverse</b>	Results in effect on integrity of attribute, or loss of part of attribute	<b>Surface Water:</b> Failure of <b>both</b> soluble and sediment-bound pollutants in HAWRAT (Method A, Annex I) but compliance with EQS values (Method B) Calculated risk of pollution from spillages >1% annually and <2% annually Partial loss in productivity of a fishery
		<b>Groundwater:</b> Partial loss or change to an aquifer Potential medium risk of pollution to groundwater from routine runoff – risk score 150-250 Calculated risk of pollution from spillages >1% annually and <2% annually Partial loss of the integrity of groundwater supported designated wetlands
		<b>Flood Risk:</b> Increase in peak flood level (1% annual probability) >50 mm
<b>Minor Adverse</b>	Results in some measurable change in attributes quality or vulnerability	<b>Surface Water:</b> Failure of <b>either</b> soluble <b>or</b> sediment-bound pollutants in HAWRAT Calculated risk of pollution from spillages >0.5% annually and <1% annually
		<b>Groundwater:</b> Potential low risk of pollution to groundwater from routine runoff – risk score <150 Calculated risk of pollution from spillages >0.5% annually and <1% annually Minor effects on groundwater supported wetlands
		<b>Flood Risk:</b> Increase in peak flood level (1% annual probability) >10mm

Magnitude	Criteria	Typical Example
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	The proposed scheme is unlikely to affect the integrity of the water environment
		<b>Surface Water:</b> No risk identified by HAWRAT (Pass both soluble and sediment-bound pollutants) Risk of pollution from spillages <0.5%
		<b>Groundwater:</b> No measurable impact upon an aquifer and risk of pollution from spillages <0.5%
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	<b>Flood Risk:</b> Negligible change in peak flood level (1% annual probability) <+/- 10 mm
		<b>Surface Water:</b> HAWRAT assessment of <b>either</b> soluble or sediment-bound pollutants becomes Pass from an existing site where the baseline was a Fail condition Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually)
		<b>Groundwater:</b> Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <1% annually)
Moderate Beneficial	Results in moderate improvement of attribute quality	<b>Flood Risk:</b> Reduction in peak flood level (1% annual probability) >10 mm
		<b>Surface Water:</b> HAWRAT assessment of <b>both</b> soluble and sediment-bound pollutants becomes Pass from an existing site where the baseline was a Fail condition Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually)
		<b>Groundwater:</b> Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is >1% annually)
Major Beneficial	Results in major improvement of attribute quality	<b>Flood Risk:</b> Reduction in peak flood level (1% annual probability) >50 mm
		<b>Surface Water:</b> Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse
		<b>Groundwater:</b> Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring Recharge of an aquifer
		<b>Flood Risk:</b> Reduction in peak flood level (1% annual probability) >100 mm

Table A4.4 – Estimating the Magnitude of an Impact on an Attribute

<b>IMPORTANT OF ATTRIBUTE</b>	<b>Very High</b>	Neutral	Moderate/Large	Large/Very Large	Very Large
	<b>High</b>	Neutral	Slight/Moderate	Moderate/Large	Large/Very Large
	<b>Medium</b>	Neutral	Slight	Moderate	Large
	<b>Low</b>	Neutral	Neutral	Slight	Slight/Moderate
		<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>
<b>MAGNITUDE OF IMPACT</b>					

**Table A4.5 – Estimating the Significance of Potential Effects**

Note:

1. Potential effects can be either beneficial or adverse. Typical examples of potential beneficial/adverse effects are described in Table A4.6. The level of significance is to be assigned **after** consideration of any proposed mitigation i.e. significance is assigned with mitigation in place allowing for the positive contribution of all mitigation that is proposed. In Scotland and Wales, the level of significance attributed should be reported both prior to mitigation and after mitigation. Particular care should be taken when considering beneficial effects to ensure the positive change is justified.
2. In some cases above the significance is shown as being one of two alternatives. In these cases a single description of significance should be decided based upon a reasoned judgement and, if necessary, consultation with the EAs.