LIST OF APPENDICES

FOREWORD

General Conditions Relating To Site Investigation

This investigation has been devised to generally comply with the relevant principles and requirements of B.S.10175:2011+A2:2017 'Investigation of potentially contaminated sites - Code of practice', science report SC050021/SR3 'Updated Technical Background to the CLEA Model' (Environment Agency, 2008), and Contaminated Land Report 11 'Model procedures for the management of contaminated land' (Department for Environment, Food and Rural Affairs and the Environment Agency, 2004) and BS EN 1997 (Eurocode 7). The recommendations made and opinions expressed in this report are based on the information obtained from the sources described using a methodology intended to provide reasonable consistency and robustness.

The opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between exploratory positions, these are only for guidance and no liability can be accepted for their accuracy.

Boring and sampling procedures are undertaken in accordance with B.S.5930:2015 'Code of Practice for Ground Investigations'. Likewise in-situ and laboratory testing complies with B.S.1377:1990 'Methods of Tests for Soils for Civil Engineering Purposes' and B.S.22475:2011, unless stated otherwise in the text. Chemical Testing has been undertaken by a UKAS accredited laboratory.

The groundwater conditions entered on the boring records are those observed at the time of investigation. The normal rate of boring usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions.

Some items of the investigation have been provided by third parties and whilst Harrison Group have no reason to doubt the accuracy, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report.

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DATASHEET: SITE INVESTIGATION METHODS

This datasheet provides basic details of the methods employed during the undertaking of site investigations. Detailed method statements may be provided if requested or further information may be obtained from the relevant British Standards or other quoted publications. Investigations are generally carried out in accordance with BS 5930:2015, “Code of practice for ground investigations”, BS 10175:2011+A1:2013, “Investigation of potentially contaminated sites – Code of Practice, and BS EN ISO 1997-2:2007, “Eurocode 7 – Geotechnical design – Part 2: Ground investigation and testing”.

Prior to any excavation being undertaken, service plans are obtained and/or a service tracing team may be employed to locate and mark up service locations. A surface sweep using a cable avoidance tool (CAT) is undertaken, in order to avoid services and service inspection pits are generally hand excavated prior to commencing work with any mechanical plant.

CABLE PERCUSSIVE BOREHOLES

The cable percussive borehole drilling rig may be towed by a 4x4 pick up or similar vehicle, and is capable of forming cased boreholes to depths of up to 50m. The hole may be formed at diameters from 300mm down to the more typical 150mm, with disturbed samples obtained direct from the drilling tools. The equipment requires a minimum 2m access width, and the rig itself is 6m long (11m including tow). A rough 3m x 5m base area is required for drilling, but each site should be considered on specifics.

The technique can penetrate dense made ground, rubble and concrete or weathered rock/thin bands of rock using a chisel. However, in some cases these materials can form obstructions.

Sampling is generally carried out in accordance with BS EN ISO 22475-1:2006, “Geotechnical investigation and testing – Sampling methods and groundwater measurements - Part 1 – Technical principles for execution”. A variety of disturbed samples can be obtained for both geotechnical and environmental purposes and undisturbed samples including U100 (thick walled OS-TK/W), UT100 (thin walled OS-T/W) and piston samples (PS-T/W) may be obtained. Standard in-situ testing may include Standard or Cone Penetration Tests (SPT/CPT) to BS EN ISO 22476-3:2005+A1:2011, “Geotechnical investigation and testing – Field testing – Part 3 – Standard penetration test”; vane testing in accordance with BS 1377-9:1990, “Methods of test for soils for civil engineering purposes” and permeability testing in accordance with BS EN ISO 22282-1-6:2012, Geotechnical investigation and testing – Geohydraulic testing – Parts 1 to 6.

Instrumentation/standpipes/monitoring wells can be installed, otherwise the borehole would be backfilled with spoil, or where instructed bentonite, concrete or sand may be used. Excess spoil is either removed from site or left in a tidy heap nearby.

In wet drilling conditions (beneath groundwater level) or where water needs to be added to facilitate drilling, the spoil can spread over a wide area through splashing and flow of the spoil from the tools, unless precautions are taken to prevent this. Conversely, the system can be very clean for instance when drilling through dry clay soil.

DYNAMIC CONTINUOUS SAMPLING (WINDOW SAMPLER) BOREHOLES

The window sampler system comprises a series of varying diameter (100mm down to 36mm) steel tubes of either 1m length, and in the case of window (rather than windowless) having a slot or window cut along the side. The tubes are driven into the ground using a light percussive hammer attached to solid rods, and withdrawn by use of a jack. The hammer may be machine mounted (wheeled or tracked) or for restricted access work, hand held. The soil sample is forced up into the tube during the driving, samples being obtained directly through the slot or window, or in the case of windowless, in plastic liners in the steel tube. The sampler generally achieves depths of around 5m in favourable soils. Use of a super heavy tracked rig allows samples to be retrieved in liners to depths of up to 10m in suitable ground conditions.

Sampling can be carried out from the boreholes in accordance with BS EN ISO 22475-1:2006 and SPT testing can be undertaken in accordance with BS EN ISO 22476-3:2005+A1:2011. In addition small diameter standpipes/monitoring wells can be installed to facilitate the sampling and monitoring of gas and groundwater.

CONE PENETRATION TESTING

A 20.5 tonne or larger truck-mounted rig is normally used, with or without tracks, to undertake cone penetration tests (CPT). The CPT unit is equipped with a hydraulic ram to drive an electric piezocone of a type conforming to the requirements of clause 3.1 of BS1377: 1990: Part 9 or BS EN ISO 22476-1.

Cone measurements can include cone tip resistance, friction sleeve resistance and dynamic pore water pressure (piezometer) sampled at a 10mm resolution. Cone maintenance, checks and calibrations are carried out in accordance with recommendations of the International Reference Procedure for CPTU (ISSMGE, 1999).

ROTARY BOREHOLES

Rotary drilling is used in hard rock areas where cable percussive or auger methods are not suitable. Drilling fluid is generally used, which are passed from the surface through hollow drill rods to the face of the drill bit to cool and lubricate the bit and transport drill cuttings to the ground surface as well as stabilising the hole in certain circumstances. Drilling fluids used include water, mist, air and in some cases mud, polymers or foam.

There are two basic types of rotary drilling; open hole drilling, where the drill bit cuts all the material within the diameter of the borehole; and core drilling, where an annular bit, fixed to the bottom of the outer rotating tube of a core barrel, cuts a core, which is recovered within the innermost tube of the core barrel assembly and bought to the surface.

Open hole drilling is often used with casing to stabilise the drill hole and is generally used to form a rapid hole in soils or weak rock. The returns and the rate of penetration are the only means of recording information so the accuracy of rock descriptions and identification of the changes of strata are limited using this method. Rotary coring is used to recover good quality core samples of the materials being drilled with various methods and diameters available, depending upon anticipated strata and requirements.

Numerous rig types are available from small track mounted units able to work in limited access situations to large lorry mounted units requiring large operating areas.

DYNAMIC PROBING

Dynamic probing (also known as 'dynamic penetration testing') is undertaken in accordance with BS EN ISO 22476-2:2005+A1:2011. A sacrificial cone is percussively driven into the ground using rods, with the number of blows taken to achieve a 10cm penetration (N_{10}) recorded. Torque is measured at 1.0m intervals when additional rods are added and depths of up to 20m are achievable in suitable ground conditions. The rods are removed using a jack, and the results presented graphically as N_{10} values against depth.

Various dynamic probe rigs with differing specifications are available with DPH (heavy) and DPSH (super heavy) generally being used. Rigs may be wheeled or tracked and are generally able to access areas at a minimum width of 1.0m and operate in a headroom of as little as 3.0m. Specifications for the type of probing usually undertaken are provided below:

DPH Penetrometer Specification

Mass of weight	*50Kg*	Drop	*500mm*
Cone	*90 degree*	Rods	*32mm diameter*

DSPH-B Penetrometer Specification

Mass of weight	*63.5Kg*	Drop	*750mm*
Cone	*90 degree*	Rods	*35mm diameter*

The results provide an assessment of the relative density of the near surface soils and are quoted as raw N_{10} values. Various correlations have been established with the results and a number of geotechnical parameters, which are provided in Annex G of BS EN 1997-2:2007 or site specific correlations with parameters such as SPT 'N' value may be derived where sufficient data is available. Raw N_{10} values should be adjusted for torque and the specific energy ratio (E_r) of the equipment used which is provided on the calibration certificate for the specific equipment.

MONITORING WELL INSTALLATIONS

All types of boreholes can be fitted with monitoring wells to enable subsequent sampling and monitoring of groundwater and ground gas levels. Monitoring wells are usually of upvc or hdpe material, although steel may also be used in certain circumstances. Various diameters are available from 19mm upwards, depending upon the size of the borehole. 38mm or 50mm diameter wells are the most commonly used. Wells generally have slotted lower sections which may have a geomesh filter and then are surrounded with a filter medium such as single sized gravel. The upper sections are generally solid casing which is usually grouted to produce a seal with the surrounding ground. The top of the well is generally fitted with a removable cap that may include a gas valve to enable future gas monitoring. The installation is usually protected by a lockable cover set in a concrete base. Details of monitoring well installations and associated backfill are given on the relevant borehole records.

BOREHOLE INSTRUMENTATION

Various types of instrumentation may be installed in boreholes to enable subsequent monitoring of groundwater levels and pressures and ground movements. Instruments that may be installed include piezometers (standpipe, vibrating wire or pneumatic), inclinometers, extensometers, settlement and strain gauges.

GROUNDWATER MONITORING

Groundwater monitoring is undertaken using an electronic dip meter, which records the depth to water in a standpipe or monitoring well. Alternatively, down-hole pressure transducers cab be utilised which can record variations over an extended period, which is particularly useful in monitoring variations due to tidal influences or when undertaking permeability tests or draw down tests or when undertaking soakaway testing. Where a non-aqueous phase liquid (e.g. floating hydrocarbon layer) is present, an interface meter is utilised to measure the thickness.

GROUND GAS MONITORING

Ground gas composition and flow monitoring may be undertaken where monitoring wells have been installed. Both flow (litres per hour) and composition (%) are measured using a portable infra-red multi-gas meter, calibrated for methane, carbon dioxide, carbon monoxide, hydrogen sulphide and oxygen. Records are also taken of atmospheric pressure, and relative pressure. The results are presented in the appendix of the report on the relevant records.

Ground gas monitoring can also be undertaken on a continuous basis using in-situ GasClam instrumentation where specific projects warrant accurate identification and quantification of the ground gas regime.

MACHINE EXCAVATED TRIAL PITS

Machine excavated trial pits are undertaken using a wheeled back-hoe or tracked 360 excavator. The hole is progressed, with the supervising Geotechnical Engineer taking samples and/ or carrying out in-situ testing as appropriate. No access may be made in to unstable/ contaminated pits, or into pits greater than 1.20m deep. Where man access is required, shoring can be provided and installed to maintain stability of the excavation. The trial pits are backfilled in compacted layers, with spoil heaped up in order to allow for future settlement. Pits may be taken to a maximum of 4.50m depth in favourable conditions.

Machine excavated trial pits require relatively large clear working areas in which to be carried out and can cause considerable disturbance to the ground surface.

HAND EXCAVATED TRIAL PITS

Hand excavated pits may be undertaken for a variety of reasons, which include service observation pits, obtaining near surface samples, and examining foundations of existing buildings. Pits are excavated using a shovel, postholers and other suitable equipment. Shoring is necessary where pits are to be extended greater than 1.2mbgl and deep excavations may take a considerable time to undertake. Detailed records of hand excavated pits are only normally recorded where foundation depths and detailed information is required.

TRIAL PIT SOAKAWAY TESTING

Soakaway tests are undertaken in machine excavated trial pits to determine the infiltration rate of the soils on a site in accordance with BRE Digest 365, "Soakaway design". The trial pit is excavated using a mechanical excavator and vertical sides are trimmed square and accurate measurements of the pit dimensions are made. In granular soils the pit is backfilled with coarse single size gravel to the top of the natural soils to prevent collapse of pit sides upon filling with water. Where granular fill is used a temporary perforated monitoring well is installed over the depth of the trial pit prior to backfilling. This allows monitoring of the water level by an electronic dip-meter or pressure transducer. In cohesive soils, granular fill may not be required and a monitoring installation is replaced by a fixed datum bar placed across one end of the pit. The water level is monitored using a tape or dip-meter. The pit is rapidly filled with water from a bowser / tanker to fill the pit to its maximum effective depth in a short time. Care is taken to prevent the collapse of pit walls. The pit is filled and allowed to drain three times to 25% full where ground conditions and time constraints allow. The water level is recorded at intervals sufficiently close to define water level versus time. The three fillings should be on the same or consecutive days. The soil infiltration rate (f) is calculated from the time taken for the water level to fall from 75% to 25% effective storage depth in the pit, using the lowest f value the three tests for design.

IN-SITU CBR TESTS

The California Bearing Ratio (CBR) test was originally conceived as a laboratory test to measure the strength of subgrade materials for pavement design purposes. The in-situ variation of the test is now widely used for assessment of the subgrade and is carried out in accordance with BS 1377: Part 9: 1990. The test set up consists of a manually operated gearbox mounted onto a stable platform (usually a 4x4 vehicle or backhoe excavator). A load ring is attached beneath the gearbox, along with a strain gauge and various extension rods with a solid plunger on the end. The gearbox is manually operated to force the plunger into the ground at a constant rate, the resultant stress is recorded by the load ring and the movement of the plunger is measured by the strain gauge acting upon a datum bar placed across the test area. The results are presented in the appendix of the report on the relevant record.

PLATE BEARING TESTS

The plate bearing test is carried out in accordance with BS 1377: Part 9: 1990. This method covers the determination of the vertical deformation and strength characteristics of soil in-situ by assessing the force and amount of penetration with time when a rigid plate is made to penetrate the soil. The test is used to evaluate the load deformation characteristics of the soil beneath the plate without entailing the effects of sample disturbance. The method may be carried out at the ground surface, in pits, trenches or adits and at the bottom of a borehole. Kentledge is usually a tracked excavator or loaded dumper.

Results may be used to directly assess settlements in equivalent foundations although size and depth differences may preclude such use. Results may also be used to assess plate modulus of elasticity (E_{PLT}) and the coefficient of sub-grade reaction (K_s), both in accordance with BS EN 1997-2:2007.

TRL DYNAMIC CONE PENETROMETER TEST (TRL DCP)

The TRL (Transport Research Laboratory) Dynamic Cone Penetrometer is an instrument designed for the rapid in-situ measurement of the structural properties of existing road pavements constructed with unbound materials. Continuous measurements are made down to a depth of 850mm, or when extension rods are use, the subgrade strata beneath can be penetrated to a depth of 2 metres. These measurements are converted to CBR values and Layer Stiffness Modulus. Where pavement layers have different strengths the boundaries can be identified and the thickness of the layers determined, similarly with the strata beneath.

The TRL DCP uses an 8kg hammer dropping through a height of 575mm and a 60^0 cone having a maximum diameter of 20mm. (this punches a clearance hole to ensure there is no friction on the rods.) The instrument is held vertically and the hammer raised to the top of the instrument and allowed to fall freely. The resulting penetration of the rod is measured and the number of blows recorded for a penetration of about 10mm (the number of blows carried out per reading of penetration can be varied to suit the strength of the layer). After the DCP is carefully withdrawn by hand cones shall be checked by measurement regularly to check the wear and replaced when necessary. From the DTP Interim Advice Note 73/06 – Design Guidance for Road Pavement Foundations, a calculation is then applied to the mm//blow to calculate the CBR value, using the following relationship with was developed by the Transport Research Laboratory

$$\mathbf{Log_{10}(CBR) = 2.48\text{-}1.057xLog_{10}(mm/blow)}$$

The following equation has been used (after Powell et al. 1984) to give an estimated value of Stiffness Modulus E, acknowledging a degree of uncertainty :

$$\mathbf{E = 17.6(CBR)^{0.65}MPa}$$

DATASHEET: GENERAL RISK ASSESSMENT METHODOLOGY

The pollutant links and initial conceptual ground model provide a potential 'source-pathway-receptor' analysis for the site based on the information presented in the report. Qualitative risk assessment allows for a consideration of the relative risk or hazard due to each potential linkage. Risk assessment is an iterative process, and as such must start at a general level, gradually becoming more specific as more cycles are performed based on better information.

An initial estimation of risk can be undertaken using the methodology set out in CIRIA 552 (2001), "Contaminated land risk assessment. A guide to good practice". This involves classification of the magnitude of the potential consequence (severity) of risk occurring (table D1) and magnitude of the probability (likelihood) of the risk occurring (table D2). These are then used to produce a risk category (table D3).

Classification	Definition	Examples
Severe	Short-terms (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short-terms risk to a particular ecosystem or organism forming part of such ecosystem (note: the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health ("significant harm" as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem (note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000).	Concentrations of a contaminant from site exceed the generic or site-specific assessment criteria. Leaching of contaminants from a site to a principal or secondary aquifer. Death of a species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ("significant harm" as defined in the *Draft Circular on Contaminated Land*, DETR, 2000). Damage to sensitive buildings/structures/ services or the environment.	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

Table D1: Classification of consequence

Classification	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probably that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible, under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the long term.

Table D2: Classification of probability

DATASHEET: GENERAL RISK ASSESSMENT METHODOLOGY (CONT.)

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low Likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

Table D3: Definition of Risk (Comparison of consequence against probability)

Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term, and are likely to be necessary over the longer term.
Moderate Risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Table D4: Description of the classified risks and likely action required

The process described above represents the general qualitative risk assessment methodology used by Harrison Group Environmental in the context of the report in which it was represented, and may not necessarily be transferable to all situations.

DATASHEET: GROUNDWATER SCREENING VALUES

Appropriate water quality standards and screening thresholds were selected in order to assess existing groundwater quality using selected indicator contaminants. Specifically, the groundwater screening values were selected from the following published limits and guideline values:

EA, 2016, Fresh waters specific pollutants and operational environmental quality standards (EQS)1

The EA has compiled applicable Environmental Quality Standards (EQS) for the assessment of surface water discharges from the following key sources:

- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- The Groundwater (Water Framework Directive) (England), Direction 2016

The following EQS values are presented:

- EQS-AA - This is the Annual Average standard, sometimes referred to as the long-term standard. Releases for assessment against this standard are often called 'long-term' releases.
- EQS-MAC -This is the 'Maximum Allowable Concentration', sometimes referred to as the short-term standard. It is normally represented as a 95 percentile concentration over a year. Releases for assessment against this standard are often called 'short-term' releases.
- Site specific bioavailable EQS for nickel, copper, manganese and zinc calculated using the Metal Bioavailability Assessment Tool (M-BAT) issued by the Water Framework Directive - United Kingdom Technical Advisory Group (UKTAG). This tool requires three input parameters (pH, dissolved organic carbon (DOC) and calcium) to calculate the bioavailable metal concentration, the Risk Characterisation Ratio (RQR) and the Predicted No Effect Concentration dissolved (PNECdissolved). The PNECdissolved can be considered a site-specific EQS. PNEC dissolved have been calculated for the site utilising average Calciumn and pH results and median DOC results obtained from nine water samples across the site.

The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015. The Water Framework Directive (WFD) (2000/60/EC).

As part of the WFD implementation, 90th percentile standards are included for biochemical oxygen demand (BOD) and total ammonia, defining the water quality (high, good, moderate, poor) associated with different pollutant levels[2]. These are summarised in table 1 below:

Type of standard	Total ammonia (mg NH_4-N/l)	BOD (mg/l)
High	0.3	4
Good	0.6	5
Moderate	1.1	6.5
Poor	2.5	9

Table 1: WFD 90th percentile Standards for Ammonia and BOD in Rivers

Drinking Water Standards

Since the bedrock aquifer at the site is classified as a 'Principal Aquifer', drinking water standards for the protection of public health were also included as part of the screening values. The values were selected according to the following hierarchy of source references:

- Schedule 1 - The Water Supply (Water Quality) Regulations 2016 (Drinking Water Standards)
- World Health Organization, 2011, Guidelines for drinking-water quality, fourth edition

Petroleum Hydrocarbons

There are no EQS or UK Drinking Water Standards for Total Petroleum Hydrocarbons (TPH) or aggregated TPH Fractions. EQS values have been published for individual constituent compounds (benzene, toluene, ethyl-benzene) and PAH compounds; these have been compiled from the sources reviewed above. Recent guidance regarding the selection of groundwater screening values for TPH fractions has been provided in the following:

- CL:AIRE, 2017. Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies. CL:AIRE, London. ISBN 978-1-905046-31-7[3].

Table summarises the fraction specific ground water quality standards reviewed in the CL:AIRE report (WHO Drinking Water Quality Standards, 2008)[4], which have been applied for reported TPH fractions. It is noted that the fractions analysed in this study do not exactly correspond to the published fractions. In that case, the lowest value for a published fraction included within the analysed range was used.

1 https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit
[2] 90th percentile standards are standards require derivation of the 90th percentile for the monitored concentrations over a minimum of 8 quarterly sampling rounds over a 2 year period.
[3] Download at www.claire.co.uk/phg.
[4] World Health Organization (WHO), 2008. Petroleum products in drinking-water. Background document for development of WHO guidelines for drinking water quality. WHO/SDE/WSH/05.08/123.

TPH Fraction	Aliphatic fraction (µg/l)	Aromatic fraction (µg/l)
EC>5-EC6	15000	10 (benzene)
EC>6-EC8	15000	700 (toluene)
EC>8-EC10	300	300 (ethylbenzene), 500 (xylenes)
EC>10-EC12	300	90
EC>12-EC16	300	90
EC>16-EC21	-	90
EC>21-EC35	-	90

Table 2: Recommended Groundwater Screening Values based on WHO Drinking Water Guidelines