HYDROGEOLOGICAL RISK ASSESSMENT

SHELLINGFORD LANDFILL EXTENSION APPLICATION

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GENERAL NOTES

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1 INTRODUCTION

1.1 Report context

Shellingford Quarry Landfill is currently operated under Environmental Permitting Regulations (EPR) Permit EPR/BP3095EU, which permits restoration of the quarry void via infilling with imported inert waste.

Planning Permission P18/V2610/CM (MW.0104/18) was granted to Multi-Agg Limited, the operator, in September 2020 and enables the extraction of sand and limestone from a western extension to Shellingford Quarry and restoration of the extraction to original ground levels using imported inert waste material and site-derived soils.

It is now necessary to vary the existing EPR permit to facilitate a Deposit for Recovery (DfR) within the western extension area.

An application to vary the EPR was submitted by GWP in 2022. The Hydrogeological Risk Assessment (HRA) accompanying the application used LandSim to quantify the risk from landfilling within the extension. This assessment was rejected by the Environment Agency (EA) on the basis that the waste will become sub-watertable on completion, which LandSim is unable to model.

This HRA has been prepared to support re-submission of the Permit Application using alternative modelling software for the quantitative risk assessment to address the issues raised by the EA.

A site location plan is provided as *Drawing 3810/HRA/01*.

2 CONCEPTUAL HYDROGEOLOGICAL SITE MODEL

2.1 General

The conceptual model forms the basis for assessment of the impact of the proposed development on the environmental baseline. Details of the baseline environment are provided in the ESSD[1] and the conceptual model is summarised below.

2.2 Site design

2.2.1 Geological conceptual model

The site is underlain by the strata from Corallian Group, which comprises the following geological sequence:

- Coral Rag Member (limestone)
- Calne Member (limestone)
- Highworth Grit Member (sand)
- Highworth Clay Member (clay)
- Highworth Limestone Member (limestone)
- Lower Calcareous Grit (sandstone)

The Coral Rag and Calne Members, which have a thickness of between 3.0 metres (m) to 5.2 m at the site, are located above the watertable, therefore these units are not considered within this assessment. The watertable is located within the Highworth Grit. The Highworth Clay acts as an aquiclude between the Highworth Grit and Highworth Limestone. The Highworth Clay is variable in thickness and was not encountered within some of the boreholes drilled within the site boundary. Therefore for the purpose of this assessment, and to be conservative, it has been assumed that the Highworth Clay is not present at the site and that the Highworth Grit and Highworth Limestone are in hydraulic continuity. The Highworth Limestone Member and Lower Calcareous Grit are saturated.

The Corallian Group is underlain by the Oxford Clay, which is considered to act as a barrier to vertical groundwater flow. This prevents a pathway being formed to deeper strata.

Shallow groundwater is considered to discharge to Holywell Brook, located 170 m south of the extension area.

1 Shellingford Quarry Landfill Environmental Setting and Site Design to Support Environmental Permit Variation Application EPR/BP3095EU/V004. Report No. 250212 v.01. GWP Consultants LLP. 2025

2.2.2 Construction details

Mineral extraction is undertaken in the extension area in six phases. Extraction commenced in the north and is progressing in a generally southwards direction. Placement of waste will also be undertaken in a southward direction and will follow on closely from mineral extraction.

Extraction is permitted to the base of the Highworth Limestone Member, which exists at a depth of approximately 15 metres below ground level (mbgl).

The groundwater is at a depth of between approximately 1 mbgl and 8 mbgl, therefore dewatering is required for mineral extraction and subsequent placement of waste for recovery.

An artificial geological barrier (AGB) is assumed to be required and would have a minimum thickness of 1 m and a permeability no greater than $1x10^{-7}$ m/s. The properties of the AGB are determined below within this HRA.

2.2.3 Groundwater control

Dewatering is undertaken during mineral extraction, construction of the artificial geological barrier and placement of waste. Abstracted water is pumped to a lagoon on the southern site boundary from where it discharges to Holywell Brook, to the south.

Once placement of waste is completed, dewatering will stop and groundwater levels allowed to rebound.

2.2.4 Source

For the purposes of this assessment it is considered that there are two sources of potential contaminants:

i. The proposed Deposit for Recovery within the extension area
ii. The extent of the currently permitted landfill which will be located up groundwater gradient of the extension area. This area is yet to be landfilled

It is proposed that Deposit for Recovery within the extension will occupy approximately 253,100 m^2. It is estimated that 1,600,000 m^3 of imported waste will be required to restore the void. However, to account for geological uncertainty a conservative figure of 2,014,000 m^3 of imported waste has been used in the Hydrogeological Risk Assessment.

The extent of the currently permitted landfill which will be located up groundwater gradient of the extension area has a footprint area of approximately 73,100 m^2. It is estimated that

482,000 m^3 of imported waste will be required to restore this area. This represents the currently permitted landfill which will be located up groundwater gradient of the extension area as per point (ii) above.

The waste codes that are included in the permit and will be accepted within the extension area are shown below in *Table 3810/HRA/T1* and matches those on the existing permit.

3810/HRA/T1: Waste codes for imported waste	
Waste code	**Description**
17 01 01	Concrete
17 01 02	Bricks
17 01 03	Tiles and ceramics
17 01 07	Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06
17 05 04	Soil and stones (excluding topsoil and peat) other than those mentioned in 17 05 03
19 12 09	Minerals (for example sand, stones) from the treatment of waste aggregates that are otherwise naturally occurring minerals – excludes fines from treatment of any non-hazardous waste or gypsum from recovered plasterboard
20 02 02	Soils and stones (excluding topsoil and peat)

All waste received at the site will be subject to Waste Acceptance Procedures (WAP) provided elsewhere in the application. It is noted that all the above waste codes are listed in Section 2.1.1 of the European Communities Council Decision 2003/33/EC, as waste codes that can be accepted without the need for compliance testing.

2.2.5 Pathways

It is considered that there are three principal pathways through which the proposed DfR could impact receptors:

1. Vertical infiltration of rainfall through the inert waste, AGB and to the Lower Calcareous Grit aquifer
2. Lateral migration of contaminants through groundwater within the Lower Calcareous Grit below the inert waste
3. Lateral migration of contaminants through the inert waste into the adjacent Highworth Grit and Highworth Limestone aquifers following cessation of dewatering and rebound of water levels

2.2.6 Receptors

The following features are considered to be potential receptors for contamination:

1. Groundwater quality in Corallian Group aquifer
2. Surface water quality within Holywell Brook and River Ock

A conceptual plan is provided on *Drawing 3810/HRA/02* and conceptual cross-sections are provided on *Drawing 3810/HRA/03*.

Identified receptors and pathways are summarised in *Table 3810/HRA/T2* below.

3810/HRA/T2: Summary of identified receptors and pathways	
Hazard	The material accepted at the site will be inert
Source	All waste to be deposited will adhere to site Waste Acceptance Procedures, which shall ensure the waste is correctly characterised and inert in nature No Hazardous substances are expected to be present at significant concentrations The existing inert landfill is partly up-gradient of the extension area and is considered to also be a source
Potential primary pathway	Vertical infiltration of rainfall through the imported material, AGB and into the Lower Calcareous Grit Lateral migration within the Lower Calcareous Grit Lateral migration through waste and adjacent Highworth Limestone and Highworth Grit following cessation of dewatering
Potential secondary pathway	Migration through Holywell Brook
Potential primary receptor	Groundwater in the Corallian Group Holywell Brook
Potential secondary receptor	River Ock
Compliance point	For Hazardous substances – groundwater immediately below the western extension For Non-hazardous pollutants – Holywell Brook

3 HYDROGEOLOGICAL RISK ASSESSMENT

3.1 Nature of the Hydrogeological Risk Assessment

Environment Agency guidance proposes a tiered approach to risk assessment such that the degree of effort and complexity reflects the potential risk posed by a particular site or situation, the sensitivity of the site setting and the degree of uncertainty and likelihood of the risk being realised.

As the source is considered to have a low potential of producing leachate, a quantitative risk screening exercise was undertaken in the first instance to identify whether aquifer dilution, on its own, is sufficient to mitigate impacts to receptors.

3.2 Risk screening

3.2.1 Collection of leachate

As the waste to be accepted at the site will be inert and will comprise naturally occurring soils, stones, brick, concrete and glass, it has a low potential to create leachate. It is, therefore, considered that there is no requirement to collect and manage leachate and hence there is no requirement for leachate drainage layers.

3.2.2 Geological barrier

For the initial screening assessment a geological barrier was assumed to not be present.

3.2.3 Source

The waste accepted at the site will follow WAPs and will comply with the inert waste codes outlined in Section 2.1.1 of the European Communities Council Decision 2003/33/EC. As a result the risk posed by the inert waste is considered to be low.

3.2.4 Location

The site is not located within a groundwater Source Protection Zone 1. Inert waste will be placed beneath the watertable. The bedrock beneath the site is defined as a Secondary A Aquifer by the EA. There are no abstractions located down-gradient of the site. However a watercourse is located down-gradient that receives groundwater discharge from the Corallian Group.

The ESSD[2] report, together with the HRA[3], constitutes a site-specific risk assessment.

3.2.5 Risk screen

On the basis of the above it is considered that there is potential for the site to pose a risk to water quality. As such a Tier 1 quantitative screening assessment has been undertaken for the proposed imported material to determine whether further assessment is required.

3.3 Tier 1 risk screening

The Tier 1 screening assessment compares the inert WAC concentrations with the determinands respective water quality standard. For those determinands where the inert WAC exceeds the respective Environmental Assessment Level (EAL), dilution calculations have been undertaken to determine if dilution within the aquifer is sufficient to prevent exceedance of the EAL.

Calculations are provided in *Appendix 3810/HRA/A1*.

3.3.1 Environmental Assessment Levels

Environmental Assessment Levels (EALs) are used as a measure against which the results of models can be compared. The Drinking Water Standards (DWS), Environmental Quality Standards (EQS) and Minimum Report Values (MRV) have been used to determine the EALs for the Tier 1 assessment. The EALs for the determinands within the screening assessment have been selected based on the most stringent of DWS, EQS and MRV values to give a conservative assessment.

Within the inert WAC the following determinands exceed their respective EALs and have been applied to the Tier 1 assessment:

- Arsenic
- Cadmium
- Copper
- Total Chromium
- Chromium VI^{+}
- Nickel
- Mercury
- Lead
- Selenium

[2] Shellingford Quarry Landfill Environmental Setting and Site Design to Support Environmental Permit Variation Application EPR/BP3095EU/V004. Report No. 250212 v.01. GWP Consultants LLP. 2025
[3] Shellingford Quarry Landfill Hydrogeological Risk Assessment to Support Environmental Permit Variation Application EPR/BP3095EU/V004. Report No. 250716 v.01. GWP Consultants LLP. 2025

- Chloride
- Sulphate
- Benzene
- Benzo-a-pyrene

3.3.2 Dilution factor

As the waste will be partially below the watertable post-closure, only dilution within the aquifer has been taken into account in the screening assessment.

The cross sectional area has been calculated using the combined width of the extension area and the up-gradient landfill. An average saturated thickness of 7 m has been assumed. This does not include the aquifer beneath the base of the landfill.

A groundwater gradient of 0.0044 has been determined from the regional groundwater elevation data and an infiltration rate of 46 mm/yr has been assumed based on a final clay loam grassed surfacing of the landfill.

Based on the above, a dilution factor of 1.09 was calculated within the aquifer immediately below the site.

3.3.3 Results

The WAC concentrations were reduced by the calculated dilution factor. This has indicated that dilution alone would not be sufficient to prevent adverse impacts to water quality.

3.4 Generic quantitative risk assessment

As the screening assessment identified that dilution only will not be sufficient to prevent impacts to water quality at Holywell Brook, a generic quantitative risk assessment has been undertaken. This was undertaken to determine the required specification for a geological barrier that would provide attenuation capacity such that pollution of groundwater or other receptors is prevented. The assessment was undertaken using the RAM3 spreadsheet model.

3.4.1 Proposed assessment scenarios

Lifecycle phases

Environment Agency guidance states that a Hydrogeological Risk Assessment must be carried out for the whole lifecycle of the site, ie from the start of the operational phase until the point at which the site is no longer capable of posing an unacceptable environmental risk.

Two scenarios have been modelled using RAM3. Separate RAM3 models have been used for each scenario:

- During the operational period where dewatering has lowered the groundwater level below the base of the waste
- Post-landfilling where the waste is partly below the watertable

Operational period model: Within this model it has been assumed that groundwater is below the base of the AGB. Only a vertical pathway through the basal AGB is considered to exist. Unsaturated aquifer will not be present below the AGB therefore horizontal flow through the Lower Calcareous Grit is considered to occur beneath the waste.

Post-operational model: This model assumes that groundwater has re-equilibrated and waste is present below the watertable. A vertical flow path through the basal AGB to the Lower Calcareous Grit is considered to occur with subsequent horizontal flow in the Lower Calcareous Grit. Horizontal pathways have also been modelled through the sidewall AGB into the Highworth Grit and Highworth Limestone separately.

The contaminant source for both models is considered to be the proposed new DfR waste and the existing permitted phases that are up-gradient of the extension area.

The conceptual models are presented on *Drawing 3810/HRA/03*.

Failure scenarios

Due to the inert nature of the proposed waste stream, there are no proposed long-term engineering management structures at the site to prevent the ingress of groundwater or the egress of leachate. Failure of such systems is, therefore, not possible and failure scenarios will not be considered.

Accidents

Accidents are considered to be unintentional incidents that could reasonably occur, which are unforeseeable at their time of occurrence. No permanent structures will be located at the site and no waste treatment or sorting will occur as part of the varied EPR/BP3095EU permit, therefore accidents are unlikely to occur.

However, it would be possible, although highly unlikely, for the acceptance of contaminated material to occur. Due to the proposed waste sources and Waste Acceptance Procedures, it is considered exceedingly unlikely that 'rogue loads' will be accidentally accepted at the site. However, in accordance with accepted practices a rogue load assessment has been undertaken and is provided in Section 3.8 below.

3.4.2 Environmentally Acceptable Levels (EALs)

Groundwater or surface water EALs are used as a measure against which the results of models can be compared. The EALs have been adopted from the compliance limits within EPR BP3095EU, which is the extant permit for the site. Where a determinand is not included in the permit the EAL was determined on the basis of available water quality standards.

Hazardous substances

The Environmental Permitting (England and Wales) Regulations 2016 (EPR, 2016) require there to be no discernible discharge of Hazardous substances to groundwater. Therefore, the appropriate EAL would be the concentration at which they become 'discernible'.

Representative Hazardous substances were selected based on the proposed waste codes and those substances failing the Tier 1 risk screen. Lead was chosen as a representative hazardous metal. Toluene was chosen to represent hazardous hydrocarbons.

Relevant quality standards are presented in *Table 3810/HRA/T3* together with the derived EAL.

3810/HRA/T3: Derivation of EALs for Hazardous substances

Substance	Limit on Environmental Permit[1]	Minimum reporting value (MRV)	Resultant EAL
Lead	100 µg/l	N/A	100 µg/l
Toluene	N/A	4 µg/l	4 µg/l

1 EPR BP3095EU Schedule 3

Non-hazardous pollutants

The EPR (2016) requires there to be no groundwater pollution caused as a result of discharges of Non-hazardous pollutants. The EALs are summarised in *Table 3810/HRA/T4*.

Ammoniacal Nitrogen has been selected due to its association with the breakdown of organic material within landfills. Nickel and Cadmium have been used to represent non-hazardous metals, and Chloride has been chosen as a conservative, non-reactive species.

3810/HRA/T4: Quality standards for Non-hazardous pollutants

Substance	Limit on Environmental Permit[1]
Ammoniacal Nitrogen	500 µg/l
Nickel	50 µg/l
Chloride	250,000 µg/l
Cadmium	0.1 µg/l

1 EPR BP3095EU Schedule 3

3.4.3 Justification for modelling approach and software

The assessment has been undertaken using ESI's (now Stantec) Risk Assessment Model 3 (RAM3) in order to determine the physical requirements of a geological barrier to prevent pollution of the water environment occurring. RAM3 has been selected as it enables modelling of the waste when it is both above and below the watertable.

Separate sources and pathways have been modelled for the permitted up-gradient phases and the proposed extension phases. The resultant concentrations from each source have been combined to determine the overall impact.

This is illustrated on *Drawings 3810/HRA/02* and *3810/HRA/03*.

3.4.4 Model parameterisation

The parameters used in the RAM3 assessment are described together with justification for their use within the RAM3 model and detailed in *Table 3810/HRA/T6*. A printout of the RAM3 models is provided as *Appendix 3810/HRA/A2*.

An Environmental Setting and Site Design (ESSD) report was completed by GWP in December 2022[4]. Groundwater elevation and water quality data have continued to be collected since the completion of this report. Data collected since 2022 is summarised below and has been used in the parameterisation of the models.

Groundwater

Groundwater data was assessed within the ESSD report up to November 2022, with groundwater contours plotted for May 2022. Hydrographs of groundwater data to the end of 2024 are shown on *Drawing 3810/HRA/05*.

Groundwater elevations were generally rising in all boreholes from 2020 and were level between June 2021 and May 2022. Following May 2022, groundwater elevations generally declined by between 1 m to 4 m until mid-2023 where they began to rise. BH01/21 was destroyed in April/May 2023.

The water levels in BH05/15 and BH02/11A, in the north of the site have not recovered following the decline in May 2022 and remain approximately 3 m lower.

[4] 210512 v.01 SHELLQMA Shellingford Quarry Landfill EPR BP3095EU V004 ESSD

The monitoring data for BH01/19 and BH01/02 does not record a significant decline in water elevations post May 2022, instead they continued to rise at a similar rate. These boreholes are located adjacent to each other in the northeast of the site.

The groundwater elevations in BH02/21 and BH04/02 have continued to vary by between 1 m and 2 m and show no overall rising or declining trend since 2020.

Groundwater contours have been plotted for December 2024 as these represent the highest recent water levels. During such a situation a greater volume of waste would be present beneath the watertable. The groundwater contour plot is shown on *Drawing 3810/HRA/04*.

In comparison to May 2022, the groundwater flow direction has remained relatively similar, generally towards the south. The groundwater elevations during May 2022 and December 2024 are within approximately 0.5 m of each other across the site.

Water quality

Groundwater quality data has continued to be collected since the ESSD report was completed in 2022. Data for the determinands that will be modelled has been analysed up until December 2024 and is presented in *Appendix 3810/HRA/A3*. A summary of the results is provided in *Table 3810/HRA/T5*.

The nature of the imported waste will not change for the DfR extension area. The dilution factor calculated for the screening assessment (Section 3.3.2) is close to 1 and therefore it has been assumed that the water quality in the boreholes located immediately adjacent and down-gradient of the area where waste has already been placed is indicative of the leachate concentrations. The down-gradient boreholes are considered to be BH03/19, BH03/11A and BH03/11B. Data from BH02/11A has also been used as it is located immediately adjacent to the infilled area.

The source concentrations for Chloride, Ammoniacal Nitrogen and Nickel have been determined based on the 95th percentile, with values less than the Limit Of Detection (LOD) assumed to be at half the LOD. For Lead there were 17 results above the LOD, with the LOD varying by 3 orders of magnitude. The source concentration for Lead was therefore conservatively based on the 95th percentile of the 17 values above the LOD. For Cadmium only 4 results were above the LOD, which varied by 3 orders of magnitude. The source concentration for Cadmium was conservatively assumed to be the highest concentration.

Over the monitoring period the LOD for Toluene has inconsistently varied between <0.10, <1.00, <3.00 and <4.00 µg/l, potentially due to the testing being undertaken by different laboratories.

When Toluene has been detected the concentration was between 0.10 µg/l and 1.00 µg/l. Therefore it is not possible to undertake any meaningful statical analysis on the results. Hence, the source concentration is assumed to be half of the highest LOD.

A summary of the selected source concentrations (pore water) is provided in *Table 3810/HRA/T5*.

3810/HRA/T5: Summary of selected source concentrations		
Substance	**Selected source concentration (mg/l)**	**Justification**
Lead	0.01285	95th percentile of results above LOD
Ammoniacal Nitrogen	0.8872	95th percentile of results
Nickel	0.112	95th percentile of results
Chloride	55.46	95th percentile of results
Toluene	0.002	Half highest LOD
Cadmium	0.000565	Highest result
Values less than Limit Of Detection (LOD) have been assumed to be at half the LOD for the statistical analysis		

Parameters

A pathway has been modelled from the source (proposed extension phases and currently permitted landfill), assumed to be the completed waste mass, vertically through the AGB into the underlying saturated Lower Calcareous Grit and then down hydraulic gradient to Holywell Brook. A horizontal pathway through the AGB and saturated Highworth Grit and Highworth Limestone has also been modelled for the post-restoration phase. Hazardous substances are modelled to the outside of the artificial barrier and Non-hazardous pollutants at Holywell Brook.

The model was run for a minimum time period of 2,000 years. This is significantly longer than the time period that is likely to be required to achieve Permit Surrender and, hence, is considered to be a conservative upper time limit for the simulation.

Parameter values were determined from information directly measured on-site or, in the absence of site data, other recognised sources. The results of the assessment are discussed below.

3810/HRA/T6: Model input parameters		
Parameter	**Value**	**Justification**
SOURCE TERM		
Waste volume (m^3)		
New phases	2,014,000	Mineral resource assessment
Existing up-gradient phases	482,000	
Source porewater concentration (mg/l)		
Lead	0.01285	See 3810/HRA/T5
Ammoniacal Nitrogen	0.8872	
Nickel	0.112	
Chloride	55.46	
Toluene	0.002	
Cadmium	0.000565	
GENERAL CONTAMINANT INFORMATION		
Free water diffusion coefficient (m^2/s):		
Lead	4.46×10^{-10}	Van Der Leer, Weatherhill, Hayes, Sharp(2001)
Ammoniacal Nitrogen	2.0×10^{-9}	Rives, 2022. Value from middle of given range
Nickel	1.0×10^{-9}	Sato, 1996
Chloride	3.23×10^{-10}	Hill, 1984
Toluene	3.60×10^{-10}	Oelkers, 1991
Cadmium	7.17×10^{-10}	PhreeqC (V3) thermodynamic database
HYDROGEOLOGICAL UNITS		
Thickness (m):		
Artificial geological barrier	1.0	Assumed
Highworth Grit (total thickness)	7.0	Hafren Water ESID, 2012.
Highworth Grit (saturated thickness)	2.0	Minimum saturated thickness (least dilution) based on groundwater monitoring. Saturated thickness expected to be greater in the south of the site.
Highworth Limestone	5.0	Hafren Water ESID, 2012.
Lower Calcareous Grit	5.5	
Hydraulic conductivity (m/s):		
Artificial Geological Barrier	1×10^{-7}	Calculated
Highworth Grit	6.5×10^{-6}	Hafren Water ESID, 2012. Highest value (shortest travel time)
Highworth Limestone	2.1×10^{-6}	Hafren Water ESID, 2012.
Lower Calcareous Grit	1.6×10^{-6}	Assumed based on testing of Highworth Grit reported in Hafren Water ESID, 2012.

3810/HRA/T6: Model input parameters		
Parameter	**Value**	**Justification**
Hydraulic gradient:		
Artificial Geological Barrier	1	Assumed vertical
Highworth Grit	0.0044	Regional hydraulic gradient. GWP HRA 2025.
Highworth Limestone	0.0044	
Lower Calcareous Grit	0.0044	
Porosity:		
Artificial Geological Barrier	0.4	Generic value for clay
Highworth Grit	0.24	Mean porosity for Corallian Group. BGS, 2004
Highworth Limestone	0.24	
Lower Calcareous Grit	0.24	
Tortuosity	5	Assumed generic value for all hydrogeological layers
Horizontal travel distance (m) to Holywell Brook:		
New phases	170	Average distance from southern side of phases.
Existing upgradient phases	956	
ATTENUATION PARAMETERS		
Dispersivity	Unit thickness/10	Standard assumption
Mixing depth (m) in:		Same as unit thickness. Oxford Clay beneath the Lower Calcareous Grit acts as the base of the aquifer.
Highworth Grit	2.0	
Highworth Limestone	5.0	
Lower Calcareous Grit	5.5	
Bulk density (kg/m^3):		
Artificial Geological Barrier	1850	Generic clay value
Highworth Grit	2000	Generic sandstone value
Highworth Limestone	2200	Generic limestone value
Lower Calcareous Grit	2000	Generic sandstone value
Fraction of organic carbon (foc)		
Artificial Geological Barrier	0.05	US EPA default concentration for foc of subsurface soils and assumption clays have typically 5 time higher organic content.
Highworth Grit	0.0004	EA 2004, Table 7.2. Approximated based on values for limestones and sandstones.
Highworth Limestone	0.0004	
Lower Calcareous Grit	0.0004	

3810/HRA/T6: Model input parameters		
Parameter	**Value**	**Justification**
Lead		
Partition coefficient (k_d) (L/kg)	2000	Sheppard 2009. Table 5-16.
Ammoniacal Nitrogen		
Partition coefficient (k_d) (L/kg)	0.5	Values from ConSim
Half life in groundwater (days)	2737	NGWCLC, 2003, Table 4.2, middle of range
Nickel		
Partition coefficient (k_d) (L/kg)	20	Values from ConSim
Chloride		
Partition coefficient (k_d) (L/kg)	0	Assumed no attenuation
Half life in groundwater (days)	No Decay	
Toluene		
Koc	190	EA 2002.
Partition coefficient (k_d) (L/kg)	Calculated	
Half life in groundwater (days)	173	Suarez and Rifai 1999, Table 9
Cadmium		
Partition coefficient (k_d) (L/kg)	5	Lowest value from Holm et al. 2003 and Lee et al. 1996
WATER BALANCE		
Vertical pathway		
Average yearly rainfall (1994 to 2022) (mm/yr)	607	Stanford rain gauge
Average daily evaporation (2007 to 2017) (mm/yr)	499	EA data
Effective rainfall (mm/yr)	108	
Infiltration through covered waste (mm/yr)	46	GWP HRA 2025, based on clay loam grassed surface and slope of cover.
Horizontal pathways		
Flow	Calculated	Darcy equation used to calculate flow through saturated thickness of waste using values above.

3.4.5 Results of the risk assessment

A quantitative risk assessment has been undertaken using the above properties to determine the impact of the proposed extension on the water environment during both the operational and post-operational situations.

The results of the assessment are provided in *Tables 3810/HRA/T7 and T8*.

3810/HRA/T7: Results of quantitative risk assessment for Non-hazardous determinands		
Operational		
Determinand	**EAL at the compliance point**	**Peak concentration at the compliance point (time to peak in years)**
Non-hazardous: Ammoniacal Nitrogen Nickel Chloride Cadmium	 0.5 mg/l 0.05 mg/l 250 mg/l 1.0 x 10^{-4} mg/l	 4.32 x 10^{-12} mg/l (180 years) 9.36 x 10^{-19} mg/l (>2000 years) 11.3 mg/l (180 years) 7.45 x 10^{-8} mg/l (>2000 years)
Post-operational		
Determinand	**EAL at the compliance point**	**Peak concentration at the compliance point (time to peak in years)**
Non-hazardous: Ammoniacal Nitrogen Nickel Chloride Cadmium	 0.5 mg/l 0.05 mg/l 250 mg/l 1.0 x 10^{-4} mg/l	 3.37 x 10^{-7} mg/l (150 years) 7.67 x 10^{-8} mg/l (>2000 years) 54.93 mg/l (200 years) 4.01 x 10^{-5} mg/l (>2000 years)

The hazardous pathway is the same in both the operational and post-operational period, ie vertically through the base of the western extension. A summary of the peak concentrations is provided in *Table 3810/HRA/T8*.

3810/HRA/T8: Results of quantitative risk assessment for hazardous determinands		
Determinand	**EAL at the compliance point**	**Peak concentration at the compliance point (time to peak in years)**
Hazardous: Lead Toluene	 0.1 mg/l 4 x 10^{-3} mg/l	 5.14 x 10^{-4} mg/l (1000 years) 8.38 x 10^{-6} mg/l (5 years)

The above results indicate that the EALs were not exceeded during either the operational or post-operational situations.

3.4.6 Artificial Geological Barrier maximum concentrations

The maximum allowable concentration of non-hazardous contaminants within the artificial geological barrier has been determined within the modelling. The results are summarised in *Table 3810/HRA/T9*. The maximum allowable concentrations for all of the non-hazardous contaminants are greater than the inert WAC limits. The waste used to construct the barrier can therefore contain non-hazardous contaminants up to the inert WAC limits without exceeding the respective EALs.

The material for the AGB will be tested to ensure that hazardous contaminants are not present above the Limit Of Detection.

3810/HRA/T9: Acceptable maximum waste concentrations for AGB			
Substance	**Calculated Maximum Allowable Source Concentration (mg/l)**	**Inert WAC (mg/kg)**	**Inert WAC (mg/l)***
Ammoniacal Nitrogen	4.78×10^{11}†	N/A	N/A
Nickel	2.21×10^{15}†	0.4	0.04
Chloride	7383	800	80
Cadmium	4.72	0.04	0.004

* 2003/33/EC: Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC

† Maximum allowable concentrations are high due to low peak breakthrough concentrations that occur within the modelling results

3.5 Review of technical precautions

Due to the nature of the waste it is considered that the proposed essential and technical precautions detailed below are appropriate and sufficient to prevent any unacceptable discharge from the site:

i) Strict control of waste types sourced and accepted
ii) Strict adherence to Waste Acceptance Criteria and Procedures for specified waste codes
iii) Provision of a 1 m thick clay geological barrier placed at a maximum permeability of $1x10^{-7}$ m/s or a geosynthetic liner material of equivalent permeability standard
iv) Monitoring of groundwater and surface water as specified in the extant environmental permit

It is considered that leachate monitoring and management is not required due to the nature of the waste.

Details of the Waste Acceptance Criteria and Procedures are considered elsewhere in the application.

3.6 Emissions to groundwater

One of the main purposes of the HRA is to establish whether the predicted discharge from the site complies with the requirements of the Environmental Permitting (England and Wales) Regulations (EPR 2016) Schedule 22 Groundwater activities.

3.6.1 Hazardous substances

The HRA must demonstrate that the proposed technical precautions will prevent hazardous substances from entering groundwater. Consequently it must consider whether there is likely to be a discernible discharge of hazardous substances to groundwater. The compliance point is, therefore, the watertable prior to any dilution occurring.

Hazardous substances are not expected to be present in the imported material at concentrations that are likely to cause a breach of the EPR (2016) and risk assessment modelling indicates that hazardous substances, included in the waste up to the concentrations provided in *Table 3810/HRA/T8*, will not breach the appropriate EAL at the watertable. The concentrations used are considered to be representative of the types of waste that will continue to be accepted at site, and the use of the highest concentrations detected is considered to be conservative. It is therefore considered that the technical precautions discussed in Section 3.5 above are sufficient to ensure that during normal operation and through to long-term post-closure, there would be no discernible discharge of hazardous substances from the waste into groundwater.

3.6.2 Non-hazardous pollutants

The HRA must also demonstrate that technical precautions will limit the introduction of non-hazardous pollutants into groundwater so as to avoid pollution. Consequently it must consider whether predicted concentrations of non-hazardous pollutants are likely to exceed relevant standards and other environmental quality criteria or cause an unacceptable deterioration in groundwater quality following dilution.

A pathway exists for non-hazardous pollutants to discharge to the Highworth Grit and Lower Calcareous Grit aquifer. The precautions outlined in Section 3.5 and the dilution within the aquifer are considered to be sufficient such that non-hazardous pollutants would be sufficiently low as to avoid derogation of receptors. The use of the 95th percentile for the source concentration is considered to be a pragmatic approach.

3.7 Emissions to surface water

Groundwater is understood to discharge to Holywell Brook. Water is also discharged to Holywell Brook to facilitate dewatering. Given the nature of the waste, the identified pathways and the technical precautions in place, it is concluded that during normal operation and through to long-term post-closure, concentrations of hazardous substances will not be discernible and non-hazardous pollutants will be sufficiently low as to avoid pollution of Holywell Brook or the downstream River Ock.

3.8 Rogue load

Rogue load analysis was undertaken on both the operational and post-operational situation. As agreed with Environment Agency during the Pre-Application discussion, the analysis was undertaken assuming 90% of the waste is at the 95th percentile of the monitoring data concentration and 10% of the waste is at 2 times the inert WAC concentration. For Ammoniacal Nitrogen the rogue load concentration was based on most likely guideline values provided by the EA, a copy of these is provided in *Appendix 3810/HRA/A4*. This approach is considered to represent the most likely rogue load scenario.

The EALs were not breached during either of the rogue load scenarios. The model assumes that all of the waste is deposited instantaneously, which results in a higher peak concentration than would occur if waste is deposited over a longer period. The models therefore give conservative estimates.

Waste Acceptance Procedures are in place at the site and will continue to be followed in the DfR western extension. Additionally, all the waste codes to be accepted at the site are listed in Section 2.1.1 of the European Communities Council Decision 2003/33/EC, as waste codes that can be accepted without the need for compliance testing due to their low potential for contamination. Therefore adherence to the WAP makes it unlikely that contaminants would be present above inert WAC limits.

A summary of the rogue load analysis is provided in *Table 3810/HRA/T10 and 3810/HRA/T11*.

3810/HRA/T10: Rogue load analysis results for non-hazardous determinands		
Determinand	**EAL at the compliance point**	**Peak concentration at the compliance point (time to peak in years)**
Operational		
Non-hazardous: Ammoniacal Nitrogen Nickel Chloride Cadmium	 0.5 mg/l 0.05 mg/l 250 mg/l 1.0 x 10^{-4} mg/l	 1.17 x 10^{-11} mg/l (180 years) 9.09 x 10^{-18} mg/l (>2000 years) 13.4 mg/l (180 years) 1.75 x 10^{-7} mg/l (>2000 years)
Post-operational		
Non-hazardous: Ammoniacal Nitrogen Nickel Chloride Cadmium	 0.5 mg/l 0.05 mg/l 250 mg/l 1.0 x 10^{-4} mg/l	 9.10 x 10^{-7} mg/l (150 years) 7.45 x 10^{-8} mg/l (>2000 years) 65.3 mg/l (200 years) 9.23 x 10^{-5} mg/l (>2000 years)

3810/HRA/T11: Rogue load analysis results for hazardous determinands		
Determinand	**EAL at the compliance point**	**Peak concentration at the compliance point (time to peak in years)**
Hazardous: Lead Toluene	 0.1 mg/l 4×10^{-3} mg/l	 8.62×10^{-4} mg/l (1000 years) 5.11×10^{-4} mg/l (5 years)

4 REQUISITE SURVEILLANCE

4.1 Risk-based monitoring scheme

The waste accepted at the site will follow WAPs and will comply with the inert waste codes outlined in Section 2.1.1 of the European Communities Council Decision 2003/33/EC. As a result the risk posed by the inert waste is considered to be low. The waste will be placed below the watertable, within a Secondary A Aquifer. There are no abstractions located down-gradient of the site, however, a watercourse is located down-gradient, which receives groundwater discharge from the Corallian Group.

Monitoring is already undertaken at the site to comply with the requirements of the extant permit. New compliance limits have been proposed by GWP Consultants LLP based on monitoring data from the boreholes up-gradient of the site. The values are three standard deviations above the geometric mean. The proposed compliance limits are shown in *Table 3810/HRA/T12*. The HRA modelling indicates that the proposed compliance limits would not be breached during either the operational or post-restoration scenarios. The proposed limits are also not be exceeded during the rogue load scenario. Chromium (total) has not been modelled, however Lead has been modelled which is considered to be a representative hazardous metal.

3810/HRA/T12: Proposed compliance limits		
Substance	**Existing compliance limit (mg/l)**	**Proposed compliance limit (mg/l)[5]**
Lead	0.1	0.033
Ammoniacal Nitrogen	0.5	0.6
Nickel	0.05	0.039
Chloride	250	133
Cadmium	0.0001	0.0021
Chromium	0.05	0.011

5 Shellingford Quarry Landfill Hydrogeological Risk Assessment to Support Environmental Permit Variation Application EPR/BP3095EU/V004. Report No. 250716 v.01. GWP Consultants LLP. 2025

5 CONCLUSIONS

5.1 Summary

Modelling has been undertaken to assess both the operational (above watertable) and post-operational (below watertable) phases of development. The EALs at the compliance points, which were set as the down-gradient watercourse and the base of the DfR western extension, were not breached in either situation.

Source concentrations were based on the 95th percentile (or the maximum recorded concentration for cadmium) of the groundwater monitoring data from boreholes located immediately adjacent to the area of the site where waste has already been deposited. The type of waste and site engineering used in this area will be used within the western extension area. Using this data is considered to give a conservative estimate of the source concentrations while also being representative of the concentrations expected to be present within the waste accepted at site.

The waste codes to be accepted at the site are listed in Section 2.1.1 of the European Communities Council Decision 2003/33/EC, as waste codes that can be accepted without the need for compliance testing due to their low potential for contamination.

Material used to construct the artificial geological barrier can contain non-hazardous contaminants up to the inert WAC limits without the potential of exceeding the EAL at the compliance point. Testing will be undertaken to ensure that hazardous contaminants are not present above the limit of detection.

A rogue load assessment was undertaken assuming that 10% of the waste received was at twice the inert WAC limits. None of the compliance limits were breached during the assessment. It should be noted that the modelling assumes that all of the waste is deposited instantaneously, which results in a higher peak concentration than if waste is deposited gradually. As the compliance limits were not breached in this situation it is considered unlikely that the proposed deposit for recovery in the western extension will pose a risk to the water environment.

5.2 Compliance with the Environmental Permitting (England and Wales) Regulations (2016)

The risk assessment has demonstrated that, under normal operations and with the proposed WAC limits and monitoring in place, hazardous substances should not be present in groundwater adjacent to the site in concentrations discernible above background and non-hazardous pollutants will not be present in concentrations such that pollution of nearby

groundwater is caused. **It is therefore considered that the site will be compliant with respect to the Environmental Permitting (England and Wales) Regulations (2016).**

6 REFERENCES

British Geological Survey BGS, 2004. Baseline Report Series 14. The Corallian of Oxfordshire and Wiltshire. Ref: NC/99/74/14

Environment Agency, 2002. R&D Technical Report P2-228/TR. The Effects of Contaminant Concentration on the Potential for Natural Attenuation

Environment Agency, 2003. ConSim release 2: Contamination impacts on groundwater: simulation by Monte Carlo method. R&D Publication 132. Nottingham: Golder Associates Ltd

Environment Agency Science Group, March 2004. Science Group report NC/03/12. Attenuation of mecoprop in the subsurface

Environment Agency, January 2024. Landfill operators: environmental permits. What to include in your hydrogeological risk assessment https://www.gov.uk/guidance/landfill-developments-groundwater-risk-assessment-for-leachate

GWP Consultants LLP, 2022. Shellingford Quarry Landfill Environmental Setting and Site Design to Support Environmental Permit Application EPR/BP3095EU/V004. 210512 v.01

GWP Consultants LLP, 2025a. Shellingford Quarry Landfill Environmental Setting and Site Design to Support Environmental Permit Variation Application EPR/BP3095EU/V004. 250212 v.01

GWP Consultants LLP, 2025b. Shellingford Quarry Landfill Hydrogeological Risk Assessment to Support Environmental Permit Variation Application EPR/BP3095EU/V004. 250716 v.01

Hafren Water, April 2012. Conceptual Model, Environmental Setting and Installation Design Report, Shellingford Quarry Landfill. SQL/ESID Version 1.2

Hafren Water, March 2012. Hydrogeological Risk Assessment Report, Shellingford Quarry Landfill. SQL/HRA Version 1.2

Hill D, 1984. Diffusion coefficients of nitrate, chloride, sulphate and water in cracked and uncracked Chalk. European Journal of Soil Science. Volume 35, Issue 1

Holm PE, Rootzen H, Borggaard OK, Moberg JP, Christensen TH, 2003. Correlation of cadmium distribution coefficients to soil characteristics. Journal of Environmental Quality, Volume 32, Issue 1, pages 138 – 145

Lee S, Allen HE, Huang CP, Sparks DL, Sanders PF, Peijnenburg WJGM, 1996. Prediction of Soil-Water Partition Coefficients for Cadmium. Environmental Science and Technology. Volume 30, Issue 12. Pages 3418 – 3424

National Groundwater and Contaminated Land Centre (NGWCLC), 2003. Review of Ammonium attenuation in soil and groundwater, National Groundwater and Contaminated Land Centre, NGWCLC Report NC/02/49

Oelkers EH, 1991. Calculation of diffusion coefficients for aqueous organic species at temperatures from 0 to 350 °C. Geochimica et Cosmochimica Acta, Volume 55, Issue 12, Pages 3515-3529

Rives R, Salavera D, Campos J, Coronas A, 2022. Development of optical digital interferometry for visualizing and modelling the mass diffusion of ammonia in water in an absorption process. Experimental Thermal and Fluid Science, Volume 130, 110509

Sato H, Yui M & Yoshikawa H, 1996. Ionic Diffusion Coefficients of Cs^{+}, Pb^{2+}, Sm^{3+}, Ni^{2+}, SeO_4^{2-} and TcO_4^{-} in Free Water Determined from Conductivity Measurements. Journal of Nuclear Science and Technology, 33(12), 950–955

Sheppard S, Long J, Sanipelli B, Sohlenius G, March 2009. Solid/liquid partition coefficients (Kd) for selected soils and sediments at Forsmark and Laxemar-Simpevarp. SKB Rapport R-09- 27

Suarez MP & Rifai HS, 1999. Biodegradation Rates for Fuel Hydrocarbons and Chlorinated Solvents in Groundwater. Bioremediation Journal. Volume 3, Issue 4. Pages 337 – 362

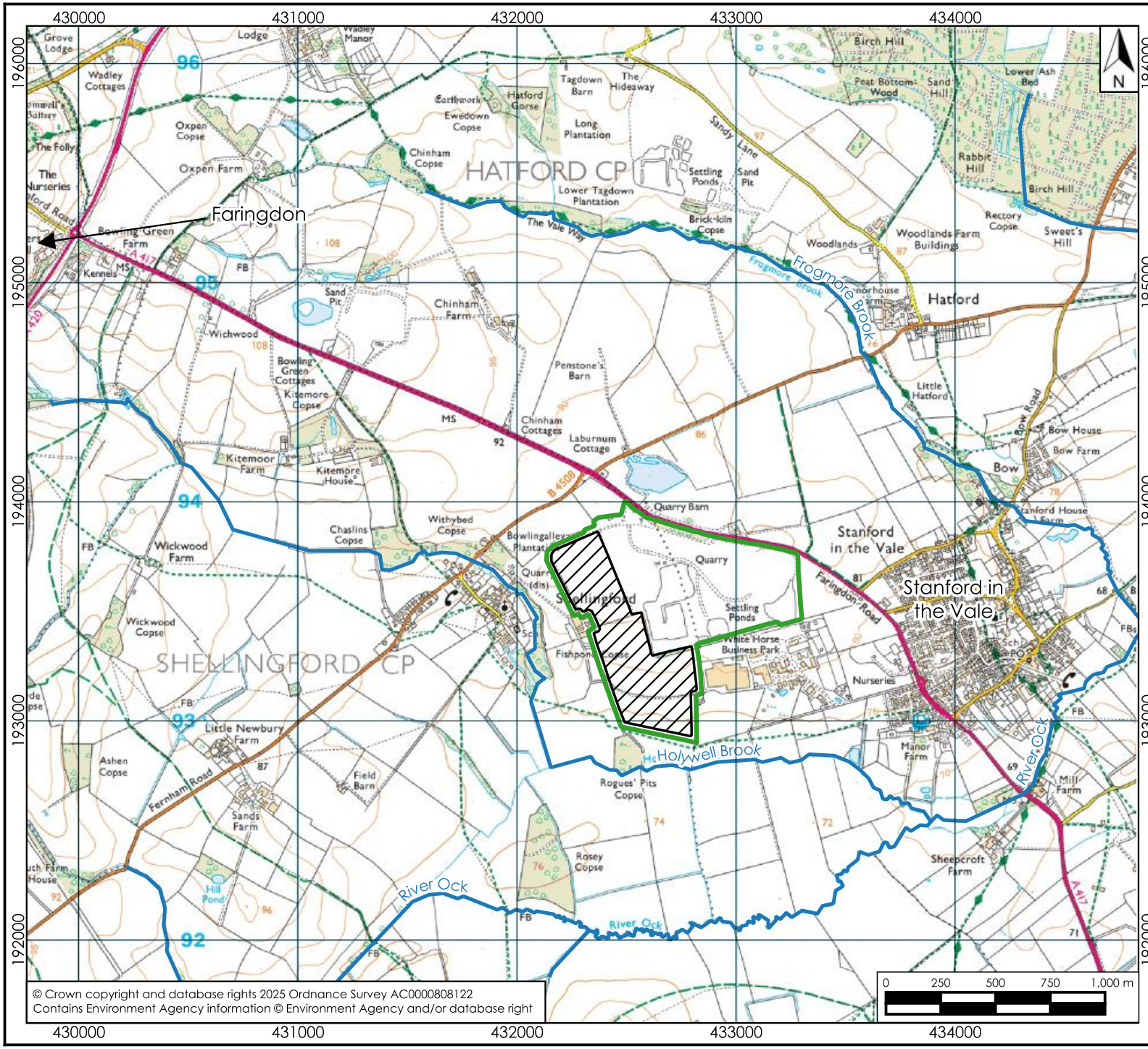
USGS, 2006. Description, properties and degradation of selected volatile organic compounds detected in groundwater. Report 2006-1338

USGS, 2025. PHREEQC Version 3

US EPA, Indiana Department of Environmental Management, September 2007. Determining the Fraction of Organic Carbon RISC nondefault option https://semspub.epa.gov/work/05/424375.pdf

Van Der Leer D, Weatherill NP, Sharp RJ, Hayes CR, 2002. Modelling the diffusion of lead into drinking water. Applied Mathematical Modelling. Volume 26, Issue 6, Pages 681-699.

DRAWINGS



Scale correct at A4

Client	Multi-Agg Ltd
Title	Site Location
Project	Shellingford Quarry
Drawing	3810/HRA/01
Version	2
Date	Oct 2025
Scale	1:25,000

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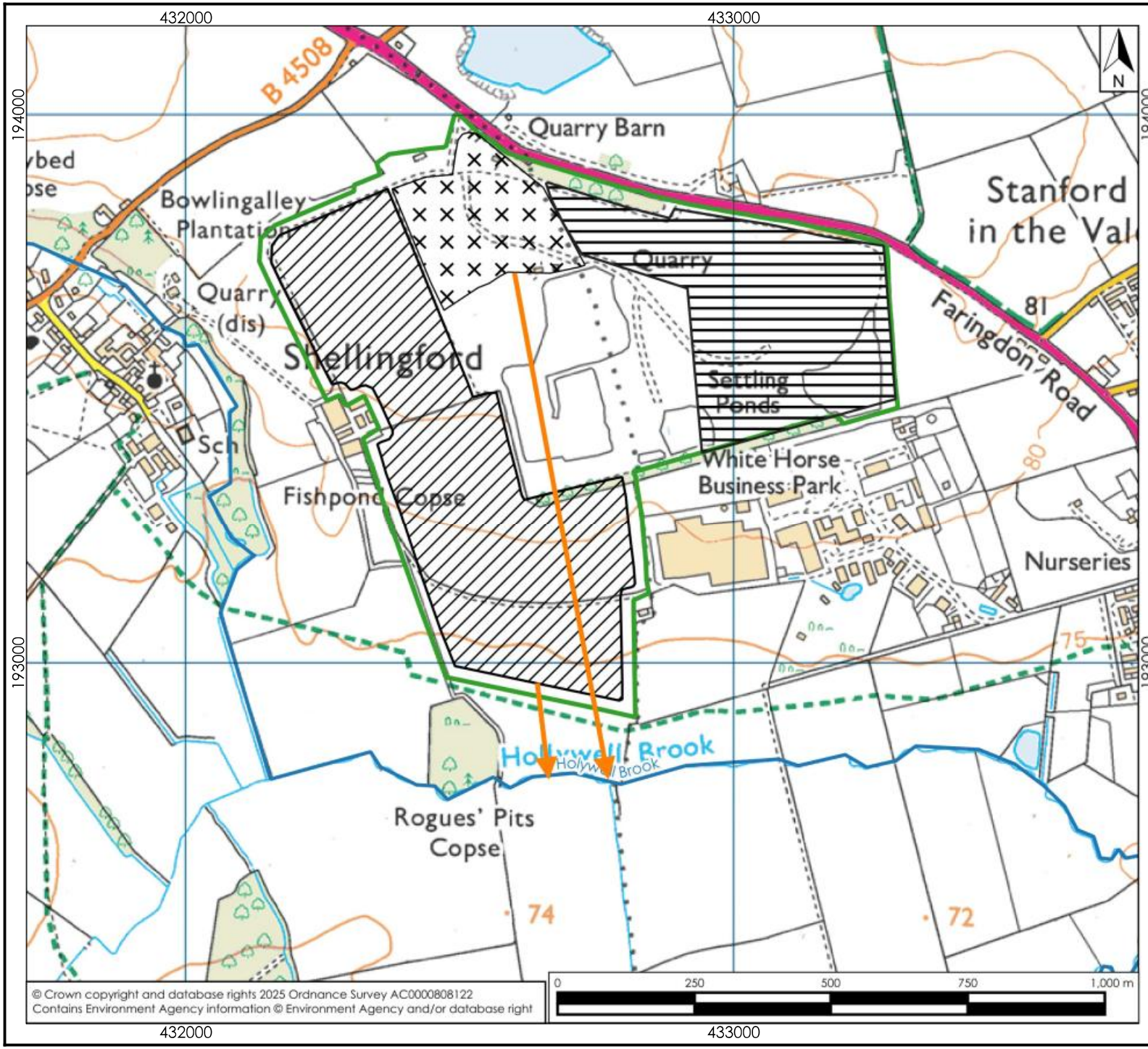

Key

- Permit Boundary
- Proposed deposit for recovery area
- Area to be landfilled upgradient of extension
- Existing Landfill
- Watercourse
- Non-hazardous contaminant transport pathway

Scale correct at A4

Client	Multi-Agg Ltd
Title	Conceptual Model Plan
Project	Shellingford Quarry
Drawing	3810/HRA/02
Version	3
Date	Oct 2025
Scale	1:10,000

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During Dewatering

N

S

Rainfall infiltration

Artificial Geological Barrier

Compliance point at Holywell Brook

Coral Rag and Calne Members

Highworth Grit

Inert Waste

Groundwater discharge to Holywell Brook

Highworth Limestone

Lower Calcareous Grit

Oxford Clay

Key

Water table

Modelled pathway

Post Groundwater Rebound

N

S

Rainfall infiltration

Artificial Geological Barrier

Compliance point at Holywell Brook

Coral Rag and Calne Members

Inert Waste

Highworth Grit

Groundwater discharge to Holywell Brook

Highworth Limestone

Lower Calcareous Grit

Oxford Clay

Client	Multi-Agg Ltd		
Title	Schematic conceptual cross sections		
Project	Shellingford Quarry		
Drawing	3810/HRA/03	Version	2
Date	Sep-25	Scale	n/a

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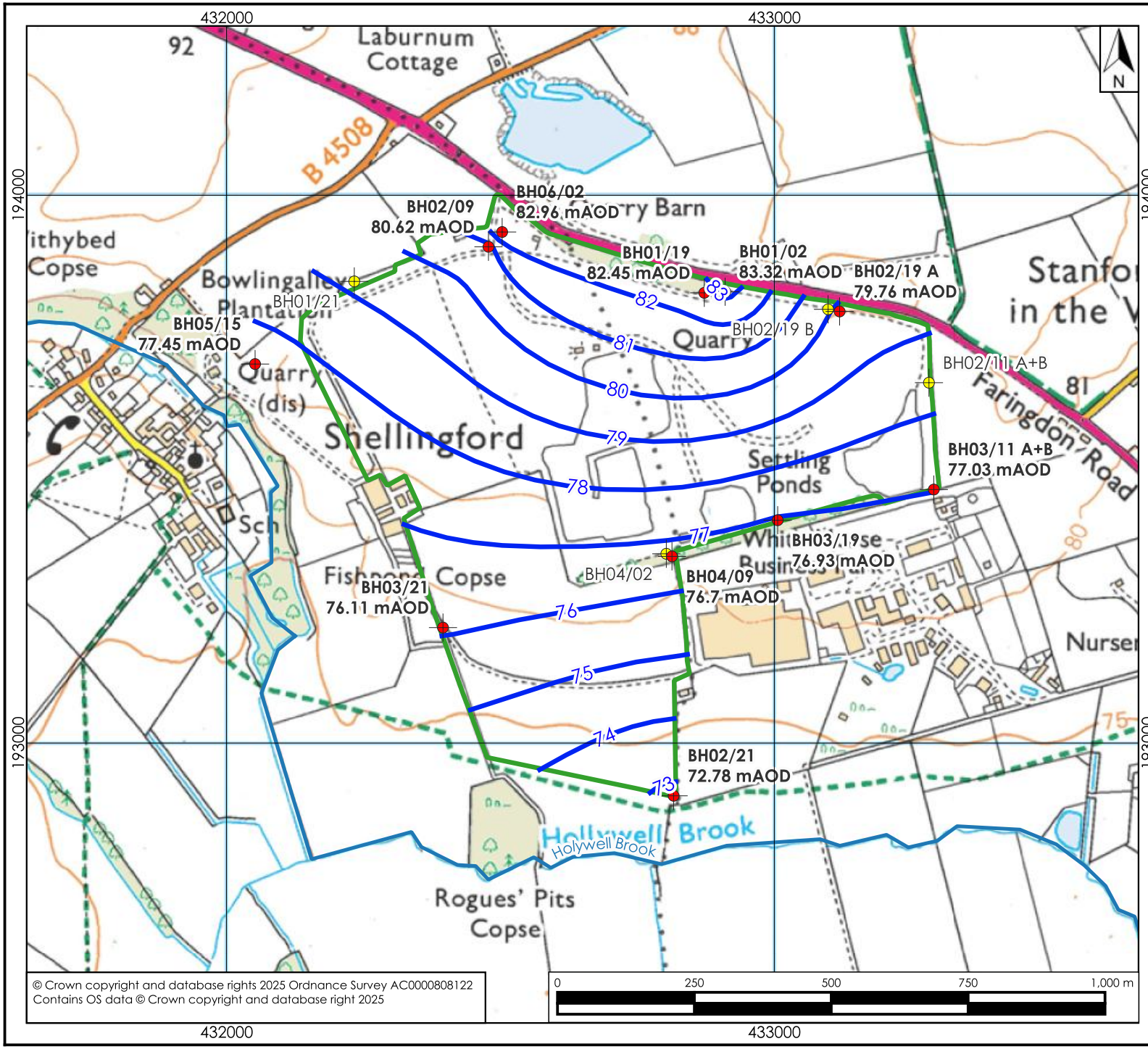

Key

- Permit Boundary
- Groundwater contours December 2024 (mAOD)
- Monitoring borehole Groundwater elevation (mAOD)
- Watercourse
- Monitoring borehole not used for contouring (no data)

BH04/02 has been excluded from the contouring as the depth of the borehole suggested it was monitoring a different horizon compared to the adjacent BH04/09

Scale correct at A4

Client	Multi-Agg Ltd
Title	Groundwater Contours December 2024
Project	Shellingford Quarry
Drawing	3810/HRA/04
Version	2
Date	Oct 2025
Scale	1:10,000

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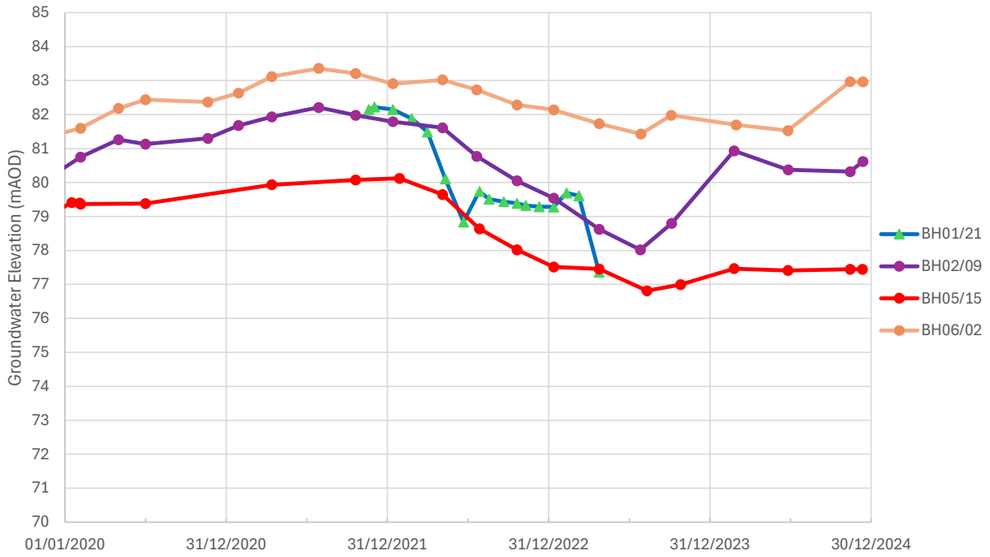
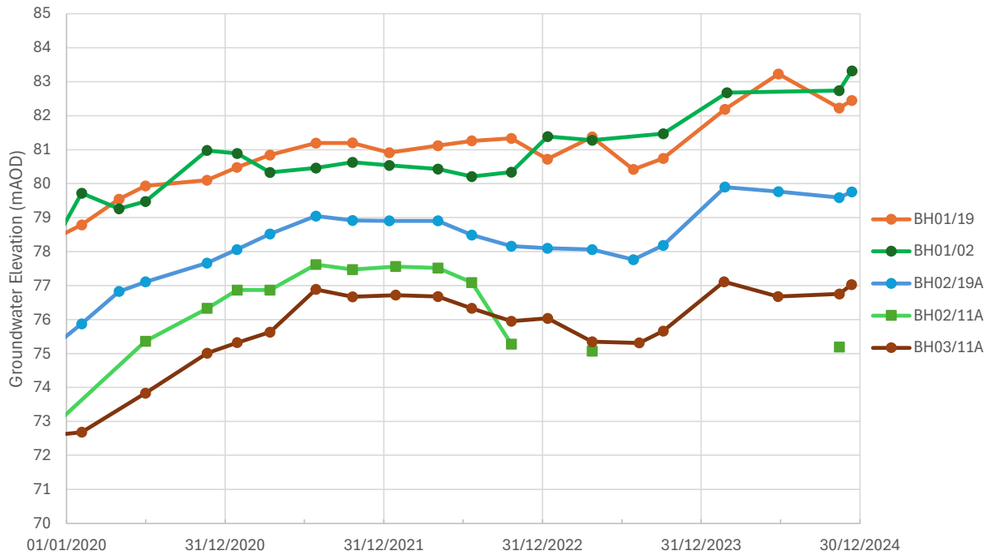
Northwestern Boreholes



Northeastern Boreholes



Southern Boreholes

Client	Multi-Agg Ltd		
Title	Groundwater Hydrographs (2020 - 2025)		
Project	Shellingford Quarry		
Drawing	3810/HRA/05	Version	1
Date	May-25	Scale	n/a

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APPENDIX 3810/HRA/A1

Tier 1 Quantitative Screening Assessment

Calc sheet by:	DI	Yellow	Data entry
Version number:	2	Green	Formulae
Date:	23/05/2025	Blue	Select from list

Generic inert Waste Acceptance Criteria (WAC) limits have been compared to appropriate screening values.

A screening exercise has been undertaken using a calculated dilution factor.

Hazardous Substances have been compared against the Minimum Reporting Values (MRV)

Non-Hazardous Substances have been compared againts User Defined values

Type of Dilution Aquifer

Screening Values (µg/l)

Parameter	Inert WAC	MRV	DWS	EQS	User Defined
Arsenic (As)+	500	5	10	50	10
Cadmium (Cd)	40	0.1	5	0.08	0.08
Copper (Cu)	2000		2	1	1
Total Chromium (Cr)	500	37.5	50	4.7	4.7
Chromium VI+		1		3.4	3.4
Nickel (Ni)	400		20	4	4
Mercury (Hg)	10	0.01	1	0.07	0.07
Lead (Pb)+	500	0.2	10		10
Selenium (Se)	100		10		10
Chloride (Cl^-)	8.0E+05		250000		250000
Sulphate (SO_4^{2-})	1.0E+06		250000		250000
Benzene	6000	1	1	10	1
Benzo-a-pyrene+	1.0E+05	5.0E-05	1.0E-02	1.7E-04	1.70E-04

Hazardous substance

+ *MRV assumed as Limit of Quantification (LoQ)*

Calculation of Dilution Factor

Site Parameters			Data Source
Rainfall infiltration rate	46.0	mm/yr	
Area of landfill	326262	m^2	Existing upgradient and proposed fill area
Total infiltration	41.12	m^3/day	

Aquifer Dilution			
Hydraulic Conductivity (k)	0.1800	m/day	Value for Highworth limestone
Hydraulic Gradient (i)	0.0044		Regional hydraulic gradient
Area	4515	m^2	645m width * 7 average depth
Flow Rate (Q)	3.58	m^3/day	

Waterbody Dilution			
Waterbody Area		m^2	
Waterbody Depth		m	
Waterbody Volume	NA	m^3	

Watercourse Dilution			
Flow Rate		m^3/sec	
Volume	NA	m^3/day	

Dilution Factor 1.09

Proposed WAC Concentrations

Parameter	WAC after dilution	Exceeds selected screening value?	Max allowable concentration	
Arsenic (As)[+]	460	Yes	5	µg/l
Cadmium (Cd)	36.80	Yes	0.09	µg/l
Copper (Cu)	1840	Yes	1	µg/l
Total Chromium (Cr)	460.0	Yes	40.8	µg/l
Chromium VI[+]	No Value	No Value	NA	µg/l
Nickel (Ni)	368	Yes	4.35	µg/l
Mercury (Hg)	9.20	Yes	0.01	µg/l
Lead (Pb)[+]	460.0	Yes	0.2	µg/l
Selenium (Se)	92.0	Yes	10.9	µg/l
Chloride (Cl^-)	735993	Yes	271742	µg/l
Sulphate (SO_4^{2-})	919992	Yes	271742	µg/l
Benzene	5520	Yes	1.09	µg/l
Benzo-a-pyrene[+]	91999	Yes	5.4E-05	µg/l

Hazardous substance

[+] *MRV assumed as Limit of Quantification (LoQ)*

Notes

Non-Hazardous substances have been compared againt DWS and EQS values due to the presence of groundwater and surface water receptors.
The EQS value for Cadmium is determined by the water hardness. As the hardness is unknown, the most stringent value has been adopted.
The EQS value for Copper is based on the bioavailable fraction.

Common Assumptions & References

Benzene concentrations are assumed as indicative of BTEX concentrations.
Benzo(a)pyrene concentrations are assumed as indicative of PAH concentrations.
Hazardous substances as defined by List I Substances under Groundwater Directive 2006/118/EC
Assumes 'leachate' density equals that of water and hence 1 mg/kg is equivalent to 1 mg/l

Council Decision Annex 2003/33/EC

The Water Supply (Water Quality) Regulations 2016

UKTAG Technical Report on Groundwater Hazardous Substances 11b(iii) v12, Sep 2016

APPENDIX 3810/HRA/A2

RAM input parameters

Source Type

☑ Soil Source ☐ Groundwater Source

Level Number

◉ Advanced

Parameter Values

◉ Deterministic ○ Probabilistic

Created: 24/04/2025 17:10:51

by: Dylan Ingman

Version: 3.34.00x Bmb

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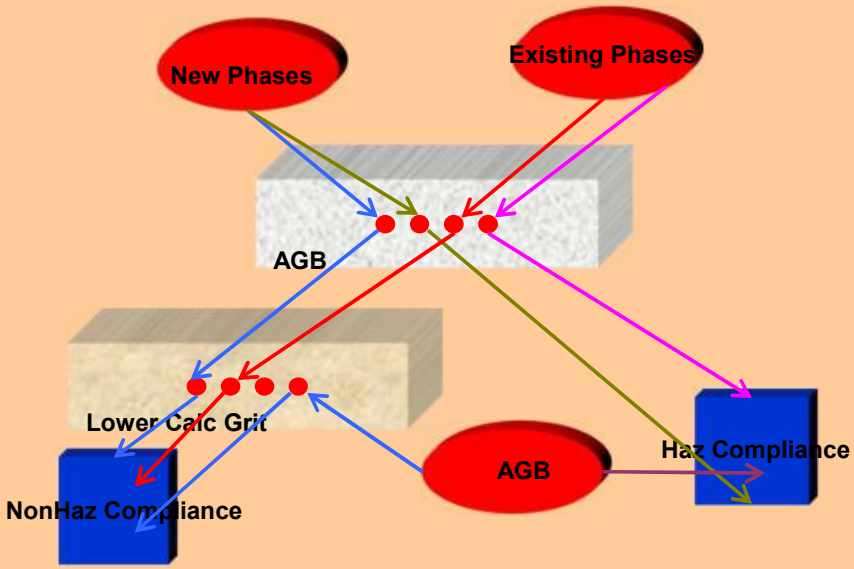


Numerical value
Suggested formula
Probabilistic parameters
Data specified elsewhere
Suggested formula edited

SOURCE CONCENTRATIONS: Existing Phases

Source Data Options

- (●) Pore water concentrations
- ( ) Leaching test
- ( ) Soil contaminant concentrations

Source Type

- ( ) Constant source
- (●) Declining source

Source Geometry

Existing_Phases_Source_length	275	**m**
Existing_Phases_Source_width	423	**m**
Existing_Phases_Source_area	73162	**m2**
Existing_Phases_Source_thickness	14	**m**
Existing_Phases_Source_volume	482000	**m3**

General Source Properties

Existing_Phases_Source_field_capacity	**[-]**	0.25

Source Contaminant Information

Source determinand names		Lead	AmmN	Nickel	Chloride	Toluene	Cadmium
Existing_Phases_Pore_water_concentration	**mg/L**	0.01285	0.8872	0.0112	55.46	0.002	0.000565
Existing_Phases_Initial_inventory	**kg**	1.548425	106.9076	1.3496	6682.93	0.241	0.068083
Existing_Phases_Input_concentration	**mg/L**	0.01285	0.8872	0.0112	55.46	0.002	0.000565

SOURCE CONCENTRATIONS: New Phases

Source Data Options

- (●) Pore water concentrations
- ( ) Leaching test
- ( ) Soil contaminant concentrations

Source Type

- ( ) Constant source
- (●) Declining source

Source Geometry

New_Phases_Source_length	1015	**m**
New_Phases_Source_width	640	**m**
New_Phases_Source_area	253100	**m2**
New_Phases_Source_thickness	14	**m**
New_Phases_Source_volume	2014000	**m3**

General Source Properties

New_Phases_Source_field_capacity	**[-]**	0.25

Source Contaminant Information

Source determinand names		Lead	AmmN	Nickel	Chloride	Toluene	Cadmium
New_Phases_Pore_water_concentration	**mg/L**	0.01285	0.8872	0.0112	55.46	0.002	5.65E-04
New_Phases_Initial_inventory	**kg**	6.469975	446.7052	5.6392	27924.11	1.007	0.284478
New_Phases_Input_concentration	**mg/L**	0.01285	0.8872	0.0112	55.46	0.002	0.000565

CONTAMINANT INFORMATION

		Species1	Species2	Species3	Species4	Species5	Species6
Source determinand names	6	Lead	AmmN	Nickel	Chloride	Toluene	Cadmium

Receptor Target Concentrations

	Name	Values in mg/L					
Quality Standard 1	CompLimit	0.1	0.5	0.05	250	0.004	0.0001
Quality Standard 2							
Quality Standard 3							
Quality Standard 4							

Generic Contaminant Properties

Contaminants_Organic_Carbon_Water_Partition_Coefficient_Koc	**L/kg**					1.90E+02	
Contaminants_Free_Water_Diffusion_Coefficient	**m2/s**	4.46E-10	2.00E-09	1.00E-09	3.23E-10	3.60E-10	7.17E-10

HYDROGEOLOGICAL UNITS

Hydrogeological Units		AGB	Lower Calc Grit
Hydrogeology_Unit_Thickness	m	1	5.5
Hydrogeology_Log_Hydraulic_Conductivity	log(m/s)		
Hydrogeology_Hydraulic_Conductivity	m/s	1.00E-07	1.60E-06
Hydrogeology_Head	m		
Hydrogeology_Hydraulic_Gradient	[-]	1	0.0044
Hydrogeology_Porosity	[-]	0.4	0.24
Hydrogeology_Velocity	m/s	2.5E-07	2.93333E-08
Hydrogeology_Tortuosity	[-]	5	5

ATTENUATION PARAMETERS

Hydrogeological Units		AGB	Lower Calc Grit
General properties			
Attenuation_Dry_bulk_density	kg/m3	1850	2000
Attenuation_Fraction_organic_carbon	[-]	0.05	0.0004
Contaminant specific parameters			
Lead			
Attenuation_Partition_Coefficient_Kd_Species_1	L/kg	2000	2000
Attenuation_Retardation_Species_1	[-]	9251	16667.66667
Attenuation_Half_Life_Species_1	days	No Decay	No Decay
Attenuation_Decay_Coefficient_Species_1	1/s	0	0
AmmN			
Attenuation_Partition_Coefficient_Kd_Species_2	L/kg	0.5	0.5
Attenuation_Retardation_Species_2	[-]	3.3125	5.166666667
Attenuation_Half_Life_Species_2	days	2737	2737
Attenuation_Decay_Coefficient_Species_2	1/s	2.93E-09	2.93114E-09
Nickel			
Attenuation_Partition_Coefficient_Kd_Species_3	L/kg	20	20
Attenuation_Retardation_Species_3	[-]	93.5	167.6666667
Attenuation_Half_Life_Species_3	days	No Decay	No Decay
Attenuation_Decay_Coefficient_Species_3	1/s	0	0
Chloride			
Attenuation_Partition_Coefficient_Kd_Species_4	L/kg	0	0
Attenuation_Retardation_Species_4	[-]	1	1
Attenuation_Half_Life_Species_4	days	No Decay	No Decay
Attenuation_Decay_Coefficient_Species_4	1/s	0	0
Toluene			
Attenuation_Partition_Coefficient_Kd_Species_5	L/kg	9.5	0.076
Attenuation_Retardation_Species_5	[-]	44.9375	1.633333333
Attenuation_Half_Life_Species_5	days	173	173
Attenuation_Decay_Coefficient_Species_5	1/s	4.64E-08	4.6373E-08
Cadmium			
Attenuation_Partition_Coefficient_Kd_Species_6	L/kg	5	5
Attenuation_Retardation_Species_6	[-]	24.125	42.66666667
Attenuation_Half_Life_Species_6	days	No Decay	No Decay
Attenuation_Decay_Coefficient_Species_6	1/s	0	0

WATER BALANCE

Above Water Table

Vertical path

Average yearly rainfall (1994 to 2022) (mm/yr)	607	GWP HRA Section 2.2
Average daily evaporation (2007 to 2017) (mm/yr)	438 - 499 - 600	min, mean, max GWP HRA Section 2.2
Effective rainfall (mm/yr)	108	GWP HRA Section 2.2
Infiltration to covered waste (mm/yr)	46	GWP HRA Section 2.2
Infiltration to covered waste (m/s)	1.45765E-09	

Q_Path New (m3/s)	0.000368932
Q_Path Existing	0.000106645

PATHWAY SUMMARY

Path 1	Section 1		Section 2		Section 3		Section 4	
Path 1 Type	Source		Unit		Unit		Receptor	
Path 1 Name	New Phases		AGB: Node 1		Lower Calc Grit: Node 1		NonHaz Compliance	
Path 1 Process	Declining source		ADRD (1D) + Dilution		ADRD (1D) + Dilution		Monitoring Borehole	
Path 1 Standards							Target Standard	CompLimit
Path 1 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	2.500E-07	Velocity [m/s]	2.933E-08		
Path 1 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1	Dispersivity [m]	17.0		
Path 1 Parameter3	Q_path [m3/s]	3.689E-04	Travel Distance [m]	1.0	Travel Distance [m]	170.0		
Path 1 Parameter4	Q_decline [m3/s]	3.689E-04	Mixing Depth [m]		Mixing Depth [m]	5.5		
Path 1 Parameter5			Mixing Width [m]		Mixing Width [m]	640.0		
Path 1 Parameter6			Q_Dilute [m3/s]	0.000E+00	Q_Dilute [m3/s]	2.478E-05	Q_dilute [m3/s]	0.000E+00

Path 2	Section 1		Section 2		Section 3	
Path 2 Type	Source		Unit		Receptor	
Path 2 Name	New Phases		AGB: Node 2		Haz Compliance	
Path 2 Process	Declining source		ADRD (1D) + Dilution		Monitoring Borehole	
Path 2 Standards					Target Standard	CompLimit
Path 2 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	2.500E-07		
Path 2 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1		
Path 2 Parameter3	Q_path [m3/s]	3.689E-04	Travel Distance [m]	1.0		
Path 2 Parameter4	Q_decline [m3/s]	3.689E-04	Mixing Depth [m]			
Path 2 Parameter5			Mixing Width [m]			
Path 2 Parameter6			Q_Dilute [m3/s]	0.000E+00	Q_dilute [m3/s]	0.000E+00

Path 3	Section 1		Section 2		Section 3		Section 4	
Path 3 Type	Source		Unit		Unit		Receptor	
Path 3 Name	Existing Phases		AGB: Node 3		Lower Calc Grit: Node 2		NonHaz Compliance	
Path 3 Process	Declining source		ADRD (1D) + Dilution		ADRD (1D) + Dilution		Monitoring Borehole	
Path 3 Standards							Target Standard	CompLimit
Path 3 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	2.500E-07	Velocity [m/s]	2.933E-08		
Path 3 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1	Dispersivity [m]	95.6		
Path 3 Parameter3	Q_path [m3/s]	1.066E-04	Travel Distance [m]	1.0	Travel Distance [m]	956.0		
Path 3 Parameter4	Q_decline [m3/s]	1.066E-04	Mixing Depth [m]		Mixing Depth [m]	5.5		
Path 3 Parameter5			Mixing Width [m]		Mixing Width [m]	423.0		
Path 3 Parameter6			Q_Dilute [m3/s]	0.000E+00	Q_Dilute [m3/s]	1.638E-05	Q_dilute [m3/s]	0.000E+00

Path 4	Section 1		Section 2		Section 3	
Path 4 Type	Source		Unit		Receptor	
Path 4 Name	Existing Phases		AGB: Node 4		Haz Compliance	
Path 4 Process	Declining source		ADRD (1D) + Dilution		Monitoring Borehole	
Path 4 Standards					Target Standard	CompLimit
Path 4 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	2.500E-07		
Path 4 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1		
Path 4 Parameter3	Q_path [m3/s]	1.066E-04	Travel Distance [m]	1.0		
Path 4 Parameter4	Q_decline [m3/s]	1.066E-04	Mixing Depth [m]			
Path 4 Parameter5			Mixing Width [m]			
Path 4 Parameter6			Q_Dilute [m3/s]	0.000E+00	Q_dilute [m3/s]	0.000E+00

Path 5	Section 1		Section 2	
Path 5 Type	Source		Receptor	
Path 5 Name	AGB		Haz Compliance	
Path 5 Process	Declining source		Monitoring Borehole	
Path 5 Standards			Target Standard	CompLimit
Path 5 Parameter1	Q_managed [m3/s]	0.000E+00		
Path 5 Parameter2	Managed time [years]	0.000E+00		
Path 5 Parameter3	Q_path [m3/s]	3.689E-04		
Path 5 Parameter4	Q_decline [m3/s]	3.689E-04		
Path 5 Parameter5				
Path 5 Parameter6			Q_dilute [m3/s]	0.000E+00

Path 6	Section 1		Section 2		Section 3	
Path 6 Type	Source		Unit		Receptor	
Path 6 Name	AGB		Lower Calc Grit: Node 4		NonHaz Compliance	
Path 6 Process	Declining source		ADRD (1D) + Dilution		Monitoring Borehole	
Path 6 Standards					Target Standard	CompLimit
Path 6 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	2.933E-08		
Path 6 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	17.0		
Path 6 Parameter3	Q_path [m3/s]	3.689E-04	Travel Distance [m]	170.0		
Path 6 Parameter4	Q_decline [m3/s]	3.689E-04	Mixing Depth [m]	12.5		
Path 6 Parameter5			Mixing Width [m]	640.0		
Path 6 Parameter6			Q_Dilute [m3/s]	5.632E-05	Q_dilute [m3/s]	0.000E+00

Source Type

☑ Soil Source ☐ Groundwater Source

Level Number

◉ Advanced

Parameter Values

◉ Deterministic ○ Probabilistic

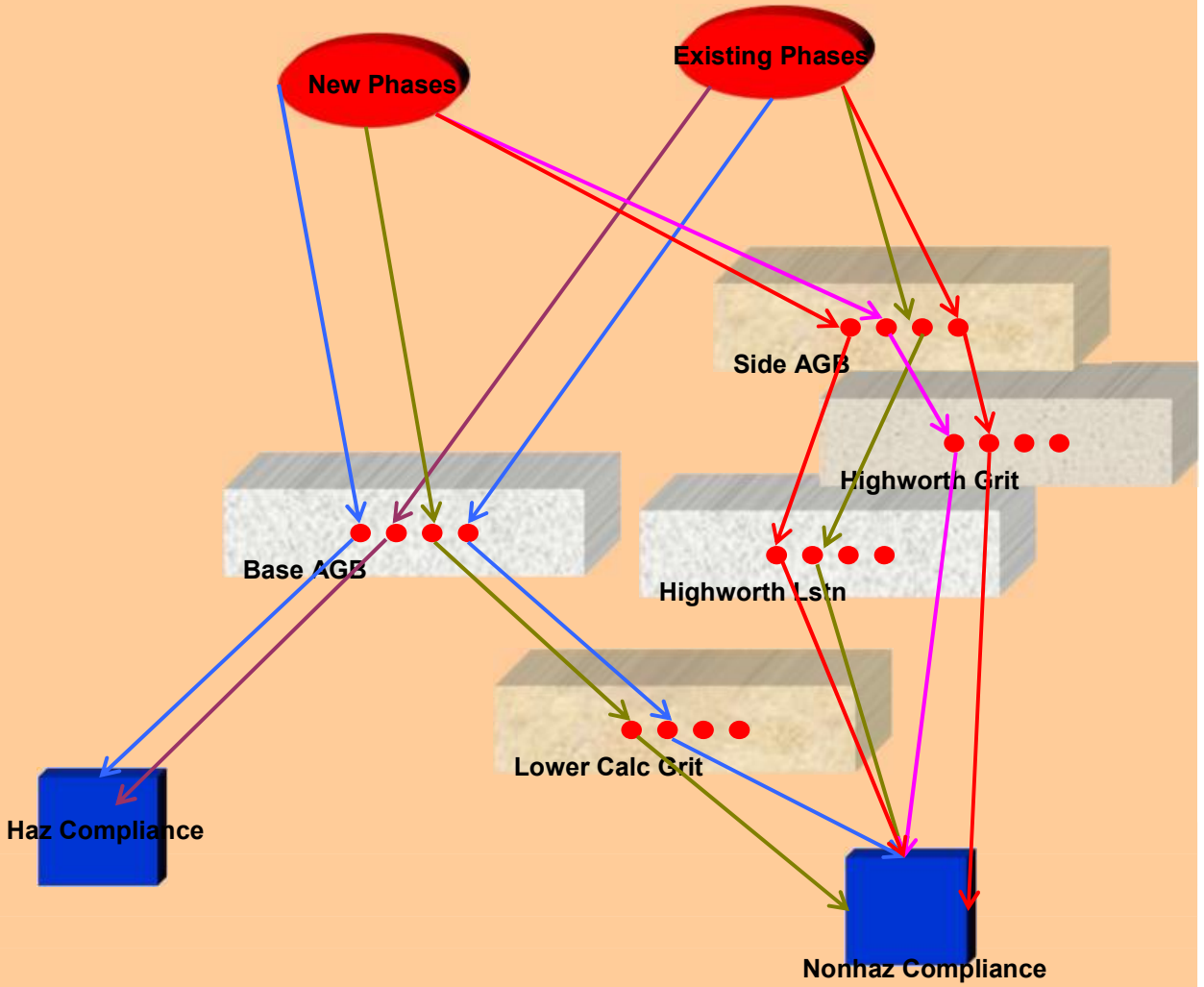
Created: 24/04/2025 17:29:13

by: Dylan Ingman

Version: 3.34.00x Bmb

Site: Shellingford Below WT

Numerical value
Suggested formula
Probabilistic parameters
Data specified elsewhere
Suggested formula edited



SOURCE CONCENTRATIONS: Existing Phases

Source Data Options

- (●) Pore water concentrations
- ( ) Leaching test
- ( ) Soil contaminant concentrations

Source Type

- ( ) Constant source
- (●) Declining source

Source Geometry

Existing_Phases_Source_length	275	**m**
Existing_Phases_Source_width	423	**m**
Existing_Phases_Source_area	73162	**m2**
Existing_Phases_Source_thickness	14	**m**
Existing_Phases_Source_volume	4.82E+05	**m3**

General Source Properties

Existing_Phases_Source_field_capacity	**[-]**	0.25

Source Contaminant Information

Source determinand names		Lead	AmmN	Nickel	Chloride	Toluene	Cadmium
Existing_Phases_Pore_water_concentration	**mg/L**	0.01285	0.8872	0.112	55.46	0.002	0.000565
Existing_Phases_Initial_inventory	**kg**	1.548425	106.9076	13.496	6682.93	0.241	0.068083
Existing_Phases_Input_concentration	**mg/L**	0.01285	0.8872	0.112	55.46	0.002	0.000565

SOURCE CONCENTRATIONS: New Phases

Source Data Options

- (●) Pore water concentrations
- ( ) Leaching test
- ( ) Soil contaminant concentrations

Source Type

- ( ) Constant source
- (●) Declining source

Source Geometry

New_Phases_Source_length	1015	m
New_Phases_Source_width	640	m
New_Phases_Source_area	253100	m2
New_Phases_Source_thickness	14	m
New_Phases_Source_volume	2.01E+06	m3

General Source Properties

New_Phases_Source_field_capacity	[-]	0.25

Source Contaminant Information

Source determinand names		Lead	AmmN	Nickel	Chloride	Toluene	Cadmium
New_Phases_Pore_water_concentration	mg/L	0.01285	0.8872	0.112	55.46	0.002	0.000565
New_Phases_Initial_inventory	kg	6.457125	445.818	56.28	27868.65	1.005	0.283913
New_Phases_Input_concentration	mg/L	0.01285	0.8872	0.112	55.46	0.002	0.000565

CONTAMINANT INFORMATION

		Species1	Species2	Species3	Species4	Species5	Species6
Source determinand names	6	Lead	AmmN	Nickel	Chloride	Toluene	Cadmium

Receptor Target Concentrations

	Name	Values in mg/L					
Quality Standard 1	Comp	0.1	0.5	0.05	250	0.004	0.0001
Quality Standard 2							
Quality Standard 3							
Quality Standard 4							

Generic Contaminant Properties

Contaminants_Organic_Carbon_Water_Partition_Coefficient_Koc	**L/kg**					190	
Contaminants_Free_Water_Diffusion_Coefficient	**m2/s**	4.46E-10	2.00E-09	1.00E-09	3.23E-10	3.60E-10	7.17E-10

HYDROGEOLOGICAL UNITS

Hydrogeological Units		Base AGB	Side AGB	Highworth Grit	Highworth Lstn	Lower Calc Grit
Hydrogeology_Unit_Thickness	m	1	1	2	5	5.5
Hydrogeology_Log_Hydraulic_Conductivity	log(m/s)					
Hydrogeology_Hydraulic_Conductivity	m/s	1.00E-07	1.00E-07	6.50E-06	2.10E-06	1.60E-06
Hydrogeology_Head	m					
Hydrogeology_Hydraulic_Gradient	[-]	1	0.0044	0.0044	0.0044	0.0044
Hydrogeology_Porosity	[-]	0.4	0.4	0.24	0.24	0.24
Hydrogeology_Velocity	m/s	2.5E-07	1.1E-09	1.19167E-07	3.85E-08	2.93333E-08
Hydrogeology_Tortuosity	[-]	5	5	5	5	5

ATTENUATION PARAMETERS

Hydrogeological Units		Base AGB	Side AGB	Highworth Grit	Highworth Lstn	Lower Calc Grit
General properties						
Attenuation_Dry_bulk_density	kg/m3	1850	1850	2000	2200	2000
Attenuation_Fraction_organic_carbon	[-]	0.05	0.05	0.0004	0.0004	0.0004
Contaminant specific parameters						
Lead						
Attenuation_Partition_Coefficient_Kd_Species_1	L/kg	2000	2000	2000	2000	2000
Attenuation_Retardation_Species_1	[-]	9251	9251	16667.66667	18334.33333	16667.66667
Attenuation_Half_Life_Species_1	days	No Decay	No Decay	No Decay	No Decay	No Decay
Attenuation_Decay_Coefficient_Species_1	1/s	0	0	0	0	0
AmmN						
Attenuation_Partition_Coefficient_Kd_Species_2	L/kg	0.5	0.5	0.5	0.5	0.5
Attenuation_Retardation_Species_2	[-]	3.3125	3.3125	5.166666667	5.583333333	5.166666667
Attenuation_Half_Life_Species_2	days	2737	2737	2737	2737	2737
Attenuation_Decay_Coefficient_Species_2	1/s	2.93114E-09	2.93E-09	2.93114E-09	2.93114E-09	2.93114E-09
Nickel						
Attenuation_Partition_Coefficient_Kd_Species_3	L/kg	20	20	20	20	20
Attenuation_Retardation_Species_3	[-]	93.5	93.5	167.6666667	184.3333333	167.6666667
Attenuation_Half_Life_Species_3	days	No Decay	No Decay	No Decay	No Decay	No Decay
Attenuation_Decay_Coefficient_Species_3	1/s	0	0	0	0	0
Chloride						
Attenuation_Partition_Coefficient_Kd_Species_4	L/kg	0	0	0	0	0
Attenuation_Retardation_Species_4	[-]	1	1	1	1	1
Attenuation_Half_Life_Species_4	days	No Decay	No Decay	No Decay	No Decay	No Decay
Attenuation_Decay_Coefficient_Species_4	1/s	0	0	0	0	0
Toluene						
Attenuation_Partition_Coefficient_Kd_Species_5	L/kg	9.5	9.5	0.076	0.076	0.076
Attenuation_Retardation_Species_5	[-]	44.9375	44.9375	1.633333333	1.696666667	1.633333333
Attenuation_Half_Life_Species_5	days	173	173	173	173	173
Attenuation_Decay_Coefficient_Species_5	1/s	4.6373E-08	4.64E-08	4.6373E-08	4.6373E-08	4.6373E-08
Cadmium						
Attenuation_Partition_Coefficient_Kd_Species_6	L/kg	5	5	5	5	5
Attenuation_Retardation_Species_6	[-]	24.125	24.125	42.66666667	46.83333333	42.66666667
Attenuation_Half_Life_Species_6	days	No Decay	No Decay	No Decay	No Decay	No Decay
Attenuation_Decay_Coefficient_Species_6	1/s	0	0	0	0	0

WATER BALANCE

Vertical path

Average yearly rainfall (1994 to 2022) (mm/yr)	607
Average daily evaporation (2007 to 2017) (mm/yr)	499
Effective rainfall (mm/yr)	108
Infiltration to covered waste (mm/yr)	46
Infiltration to covered waste (m/s)	1.45765E-09
Q_Path New (m3/s)	0.000368932
Q_Path Existing	0.000106645

Horizontal flow through Highworth Grit

K (m/s)	6.50E-06
i	0.0044
A (m2) (new phases)	1280
A (m2) (existing phases)	846
Q (new phases)	3.66E-05
Q (existing phases)	2.42E-05

Horizontal flow through Highworth Limestone

K (m/s)	2.10E-06
i	0.0044
A (m2) (new phases)	3200
A (m2) (existing phases)	2115
Q (new phases)	2.96E-05
Q (existing phases)	1.95E-05

Water Balance Check

K (weighted) (m/s)	3.36E-06
i	0.0044
A (m2) (both phases)	4515
Q (m3/s)	4.52E+03
Difference between combined horizontal Q and sum of individual Q's	0.00%

PATHWAY SUMMARY

Path 1	Section 1		Section 2		Section 3	
Path 1 Type	Source		Unit		Receptor	
Path 1 Name	New Phases		Base AGB: Node 1		Haz Compliance	
Path 1 Process	Declining source		ADRD (1D) + Dilution		Monitoring Borehole	
Path 1 Standards					Target Standard	Comp
Path 1 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	2.500E-07		
Path 1 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1		
Path 1 Parameter3	Q_path [m3/s]	3.689E-04	Travel Distance [m]	1.0		
Path 1 Parameter4	Q_decline [m3/s]	3.689E-04	Mixing Depth [m]			
Path 1 Parameter5			Mixing Width [m]			
Path 1 Parameter6			Q_Dilute [m3/s]	0.000E+00	Q_dilute [m3/s]	0.000E+00

Path 2	Section 1		Section 2		Section 3		Section 4	
Path 2 Type	Source		Unit		Unit		Receptor	
Path 2 Name	New Phases		Base AGB: Node 3		Lower Calc Grit: Node 1		Nonhaz Compliance	
Path 2 Process	Declining source		ADRD (1D) + Dilution		ADRD (1D) + Dilution		Monitoring Borehole	
Path 2 Standards						Target Standard	Comp	
Path 2 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	2.500E-07	Velocity [m/s]	2.933E-08		
Path 2 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1	Dispersivity [m]	17.0		
Path 2 Parameter3	Q_path [m3/s]	3.689E-04	Travel Distance [m]	1.0	Travel Distance [m]	170.0		
Path 2 Parameter4	Q_decline [m3/s]	3.689E-04	Mixing Depth [m]		Mixing Depth [m]	5.5		
Path 2 Parameter5			Mixing Width [m]		Mixing Width [m]	640.0		
Path 2 Parameter6			Q_Dilute [m3/s]	0.000E+00	Q_Dilute [m3/s]	2.478E-05	Q_dilute [m3/s]	0.000E+00

Path 3	Section 1		Section 2		Section 3		Section 4	
Path 3 Type	Source		Unit		Unit		Receptor	
Path 3 Name	New Phases		Side AGB: Node 1		Highworth Lstn: Node 1		Nonhaz Compliance	
Path 3 Process	Declining source		ADRD (1D) + Dilution		ADRD (1D) + Dilution		Monitoring Borehole	
Path 3 Standards						Target Standard	Comp	
Path 3 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	1.100E-09	Velocity [m/s]	3.850E-08		
Path 3 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1	Dispersivity [m]	17.0		
Path 3 Parameter3	Q_path [m3/s]	2.957E-05	Travel Distance [m]	1.0	Travel Distance [m]	170.0		
Path 3 Parameter4	Q_decline [m3/s]	2.957E-05	Mixing Depth [m]	5.0	Mixing Depth [m]	5.0		
Path 3 Parameter5			Mixing Width [m]	640.0	Mixing Width [m]	640.0		
Path 3 Parameter6			Q_Dilute [m3/s]	1.408E-06	Q_Dilute [m3/s]	2.957E-05	Q_dilute [m3/s]	0.000E+00

Path 4	Section 1		Section 2		Section 3		Section 4	
Path 4 Type	Source		Unit		Unit		Receptor	
Path 4 Name	New Phases		Side AGB: Node 2		Highworth Grit: Node 1		Nonhaz Compliance	
Path 4 Process	Declining source		ADRD (1D) + Dilution		ADRD (1D) + Dilution		Monitoring Borehole	
Path 4 Standards						Target Standard	Comp	
Path 4 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	1.100E-09	Velocity [m/s]	1.192E-07		
Path 4 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1	Dispersivity [m]	17.0		
Path 4 Parameter3	Q_path [m3/s]	3.661E-05	Travel Distance [m]	1.0	Travel Distance [m]	170.0		
Path 4 Parameter4	Q_decline [m3/s]	3.661E-05	Mixing Depth [m]	2.0	Mixing Depth [m]	2.0		
Path 4 Parameter5			Mixing Width [m]	640.0	Mixing Width [m]	640.0		
Path 4 Parameter6			Q_Dilute [m3/s]	5.632E-07	Q_Dilute [m3/s]	3.661E-05	Q_dilute [m3/s]	0.000E+00

Path 5	Section 1		Section 2		Section 3	
Path 5 Type	Source		Unit		Receptor	
Path 5 Name	Existing Phases		Base AGB: Node 2		Haz Compliance	
Path 5 Process	Declining source		ADRD (1D) + Dilution		Monitoring Borehole	
Path 5 Standards					Target Standard	Comp
Path 5 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	2.500E-07		
Path 5 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1		
Path 5 Parameter3	Q_path [m3/s]	1.066E-04	Travel Distance [m]	1.0		
Path 5 Parameter4	Q_decline [m3/s]	1.066E-04	Mixing Depth [m]			
Path 5 Parameter5			Mixing Width [m]			
Path 5 Parameter6			Q_Dilute [m3/s]	0.000E+00	Q_dilute [m3/s]	0.000E+00

Path 6	Section 1		Section 2		Section 3		Section 4	
Path 6 Type	Source		Unit		Unit		Receptor	
Path 6 Name	Existing Phases		Base AGB: Node 4		Lower Calc Grit: Node 2		Nonhaz Compliance	
Path 6 Process	Declining source		ADRD (1D) + Dilution		ADRD (1D) + Dilution		Monitoring Borehole	
Path 6 Standards						Target Standard	Comp	
Path 6 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	2.500E-07	Velocity [m/s]	2.933E-08		
Path 6 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1	Dispersivity [m]	95.6		
Path 6 Parameter3	Q_path [m3/s]	1.066E-04	Travel Distance [m]	1.0	Travel Distance [m]	956.0		
Path 6 Parameter4	Q_decline [m3/s]	1.066E-04	Mixing Depth [m]		Mixing Depth [m]	5.5		
Path 6 Parameter5			Mixing Width [m]		Mixing Width [m]	423.0		
Path 6 Parameter6			Q_Dilute [m3/s]	0.000E+00	Q_Dilute [m3/s]	1.638E-05	Q_dilute [m3/s]	0.000E+00

Path 7	Section 1		Section 2		Section 3		Section 4	
Path 7 Type	Source		Unit		Unit		Receptor	
Path 7 Name	Existing Phases		Side AGB: Node 3		Highworth Lstn: Node 2		Nonhaz Compliance	
Path 7 Process	Declining source		ADRD (1D) + Dilution		ADRD (1D) + Dilution		Monitoring Borehole	
Path 7 Standards						Target Standard	Comp	
Path 7 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	1.100E-09	Velocity [m/s]	3.850E-08		
Path 7 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1	Dispersivity [m]	95.6		
Path 7 Parameter3	Q_path [m3/s]	1.954E-05	Travel Distance [m]	1.0	Travel Distance [m]	956.0		
Path 7 Parameter4	Q_decline [m3/s]	1.954E-05	Mixing Depth [m]	5.0	Mixing Depth [m]	5.0		
Path 7 Parameter5			Mixing Width [m]	423.0	Mixing Width [m]	423.0		
Path 7 Parameter6			Q_Dilute [m3/s]	9.306E-07	Q_Dilute [m3/s]	1.954E-05	Q_dilute [m3/s]	0.000E+00

Path 8	Section 1		Section 2		Section 3		Section 4	
Path 8 Type	Source		Unit		Unit		Receptor	
Path 8 Name	Existing Phases		Side AGB: Node 4		Highworth Grit: Node 2		Nonhaz Compliance	
Path 8 Process	Declining source		ADRD (1D) + Dilution		ADRD (1D) + Dilution		Monitoring Borehole	
Path 8 Standards						Target Standard	Comp	
Path 8 Parameter1	Q_managed [m3/s]	0.000E+00	Velocity [m/s]	1.100E-09	Velocity [m/s]	1.192E-07		
Path 8 Parameter2	Managed time [years]	0.000E+00	Dispersivity [m]	0.1	Dispersivity [m]	95.6		
Path 8 Parameter3	Q_path [m3/s]	2.420E-05	Travel Distance [m]	1.0	Travel Distance [m]	956.0		
Path 8 Parameter4	Q_decline [m3/s]	2.420E-05	Mixing Depth [m]	2.0	Mixing Depth [m]	2.0		
Path 8 Parameter5			Mixing Width [m]	423.0	Mixing Width [m]	423.0		
Path 8 Parameter6			Q_Dilute [m3/s]	3.722E-07	Q_Dilute [m3/s]	2.420E-05	Q_dilute [m3/s]	0.000E+00

APPENDIX 3810/HRA/A3

Water quality data

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH01/02	29/05/2007	0.59	0.003	81	0.005	0.012	
BH01/02	27/06/2007	0.55	0.001	130	0.016	0.007	
BH01/02	31/07/2007	0.72	0.0005	108	<0.005	0.007	
BH01/02	29/08/2007	0.55	0.0007	88	<0.005	<0.005	
BH01/02	25/09/2007	0.66	0.0005	89	<0.005	0.005	
BH01/02	30/10/2007	0.61	0.0005	82	0.006	0.011	
BH01/02	26/11/2007	0.65	0.0035	75	<0.005	0.079	
BH01/02	04/01/2008	0.69	<0.0005	99	<0.005	0.006	
BH01/02	30/01/2008	0.54	<0.0005	90	<0.005	0.006	
BH01/02	25/02/2008	0.72	<0.0005	74	<0.005	0.007	
BH01/02	27/03/2008	0.55	<0.0005	78	<0.005	0.007	
BH01/02	28/04/2008	0.62	<0.0005	75	<0.005	0.006	
BH01/02	27/05/2008	0.8	<0.0005	75	<0.005	0.009	
BH01/02	19/06/2008	0.92	0.0008	81	<0.005	0.013	
BH01/02	30/07/2008	0.42	0.0007	91	0.007	0.014	
BH01/02	26/08/2008	0.4	<0.0005	66	<0.005	0.007	
BH01/02	30/09/2008	0.55	0.002	68	0.024	0.005	
BH01/02	31/10/2008	0.54	<0.0003	74	<0.002	0.0117	
BH01/02	26/11/2008	0.69	<0.0003	120	0.002	0.0059	
BH01/02	15/12/2008	0.59	<0.0003	82	0.006	0.0067	
BH01/02	28/01/2009	0.4	<0.0003	108	0.004	0.0057	
BH01/02	24/02/2009	0.21	0.0004	90	0.002	0.0039	
BH01/02	20/03/2009	0.24	<0.0003	79	0.009	<0.0009	
BH01/02	20/04/2009	0.29	0.0015	85	0.017	<0.0009	
BH01/02	27/05/2009	0.33	0.0004	79	0.006	0.0085	
BH01/02	23/06/2009	0.37	0.0012	77	0.019	0.006	
BH01/02	28/07/2009	0.3	0.0005	75	0.012	0.0038	
BH01/02	26/08/2009	0.3	0.0004	70	0.006	0.0057	
BH01/02	24/09/2009	0.33	<0.0003	79		0.0062	<0.10
BH01/02	17/12/2009	0.38	<0.0003	115		0.0517	<0.10
BH01/02	25/03/2010	0.12	0.0011	89	0.028	0.0175	<0.10
BH01/02	30/06/2010	<0.02	0.0026	91	<0.01	<0.01	<3.0
BH01/02	23/09/2010	0.48	<0.0006	85.3	0.009	0.012	<0.10
BH01/02	27/01/2011	1.5	0.0001	366	<0.005	0.015	<0.10
BH01/02	27/04/2011	4.61	<0.00005	98.9	0.009	<0.002	0.15
BH01/02	22/10/2012	1.46	<0.00005	85.8	<0.006	0.009	<0.10
BH01/02	28/01/2013	1.86	<0.0001	99.5	0.000193	0.00626	<4.00
BH01/02	22/04/2013	1.13	<0.0001	71.6	<0.00002	0.00973	<4.00
BH01/02	30/07/2013	1.98	<0.0001	72.8	0.000045	0.00448	<4.00
BH01/02	07/11/2013	0.585	<0.0001	110	0.000204	0.00774	<4.00
BH01/02	28/01/2014	0.333	<0.0001	111	0.000057	0.01	<4.00
BH01/02	09/04/2014	0.597	<0.0001	91.8	0.000022	0.0104	<4.00
BH01/02	09/07/2014	1.07	<0.0001	60.1	<0.00002	0.00644	<4.00
BH01/02	28/10/2014	1.76	<0.0001	108	0.000081	0.0077	<4.00
BH01/02	19/11/2020	<0.30	<0.00008	228	<0.0002	0.00584	<4.00
BH01/02	27/01/2021	<0.30	<0.00008	179	<0.0002	0.00438	<4.00
BH01/02	28/07/2021	1.21	<0.00008	153	0.000203	0.00587	<1.00
BH01/02	12/01/2022	0.3	<0.001	186	<0.001	0.011	<1.00
BH01/02	21/07/2022	6.39	<0.00008	190	<0.0002	0.0106	<1.00
BH01/02	20/10/2022	1.3	<0.0005	584	<0.0005	0.0253	<1.00
BH01/02	11/01/2023	0.1	<0.001	578	<0.001	0.013	<1.00
BH01/02	24/04/2023	<0.1	<0.001	340	<0.001	0.011	<1.00
BH01/02	04/10/2023	0.6	<0.001	332	<0.001	0.01	<1.00
BH01/02	28/02/2024	0.6	<0.001	486	<0.001	0.016	<1.00
BH01/02	12/11/2024	0.105	<0.0001	880	<0.0006	0.00845	< 1.0

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH02/02	25/07/2005	0.05	0.0020	668	0.14	0.091	
BH02/02	25/10/2005	<0.3	<0.0005	927	<0.005	0.006	<1.0
BH02/02	04/01/2006	0.5	0.002	777	0.15	0.089	
BH02/02	24/04/2006	<0.3	0.0005	556	0.009	0.013	
BH02/02	24/07/2006	<0.3	0.001	221	0.11	0.096	
BH02/02	27/10/2006	<0.3	0.001	68	<0.005	<0.005	
BH02/02	31/01/2007	0.7	0.004	67	0.044	<0.005	
BH02/02	23/04/2007	<0.3	0.0005	69	0.02	0.015	
BH02/02	29/05/2007	<0.04	0.005	98	0.09	0.1	
BH02/02	27/06/2007	0.07	0.001	75	0.028	0.029	
BH02/02	31/07/2007	0.28	0.0005	68	0.006	0.009	
BH02/02	29/08/2007	<0.04	0.0007	65	0.025	0.023	
BH02/02	25/09/2007	0.12	0.0007	69	0.051	0.045	
BH02/02	30/10/2007	0.08	0.0022	72	0.089	0.082	
BH02/02	26/11/2007	0.17	0.0005	75	<0.005	<0.005	
BH02/02	04/01/2008	0.07	0.0012	75	0.063	0.068	
BH02/02	30/01/2008	0.13	0.0006	72	0.053	0.048	
BH02/02	25/02/2008	0.16	<0.0005	58	0.025	0.028	
BH02/02	27/03/2008	<0.04	<0.0005	59	0.025	0.028	
BH02/02	28/04/2008	<0.04	<0.0005	60	0.006	0.011	
BH02/02	27/05/2008	0.05	0.0006	61	<0.005	<0.005	
BH02/02	19/06/2008	0.07	0.0006	59	<0.005	<0.005	
BH02/02	30/07/2008	0.08	0.001	66	0.013	0.018	
BH02/02	26/08/2008	0.09	<0.0005	70	0.015	0.009	
BH02/02	30/09/2008	<0.04	0.0016	72	0.018	<0.005	
BH02/02	31/10/2008	0.05	0.0007	70	0.015	0.0212	
BH02/02	26/11/2008	0.05	0.0005	79	0.022	0.0413	
BH02/02	15/12/2008	<0.04	<0.0003	72	0.004	0.0047	
BH02/02	28/01/2009	0.05	<0.0003	73	0.007	0.0051	
BH02/02	24/02/2009	0.05	0.0011	73	0.006	0.0018	
BH02/02	20/03/2009	<0.04	0.0004	70	0.027	0.0186	
BH02/02	20/04/2009	<0.04	0.0013	72	0.025	0.0068	
BH02/02	27/05/2009	<0.04	0.0006	73	0.012	0.0127	
BH02/02	23/06/2009	<0.04	0.0017	73	0.037	0.0228	
BH02/02	28/07/2009	<0.04	0.0006	76	0.017	0.013	
BH02/02	26/08/2009	<0.04	0.0005	70	0.025	0.0289	
BH02/02	24/09/2009	<0.04	<0.0003	81		0.0138	<0.10
BH02/02	17/12/2009	<0.04	0.0006	76		0.0116	<0.10
BH02/02	24/03/2010	<0.04	<0.0003	108	<0.002	0.0023	0.17
BH02/02	30/06/2010	<0.02	0.013	110	0.07	0.11	<3.0
BH02/02	23/09/2010	<0.04	0.0013	109	0.084	0.091	0.24
BH02/02	27/01/2011	<0.19	0.00005	104	<0.005	0.008	0.17

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH03/02	25/07/2005	<0.04	<0.0005	86	0.071	0.063	
BH03/02	25/10/2005	<0.3	<0.0005	55	<0.005	<0.005	<1.0
BH03/02	04/01/2006	<0.3	0.001	71	0.082	0.054	
BH03/02	24/04/2006	<0.3	0.0005	81	<0.005	0.009	
BH03/02	24/07/2006	<0.3	0.0005	57	0.011	0.01	
BH03/02	27/10/2006	<0.3	0.0005	67	<0.005	<0.005	
BH03/02	31/01/2007	<0.3	0.005	68	0.058	<0.005	
BH03/02	23/04/2007	<0.3	0.0005	63	0.014	0.01	
BH03/02	29/05/2007	<0.04	0.003	81	0.043	0.068	
BH03/02	25/09/2007	<0.04	0.0008	69	0.057	0.038	
BH03/02	30/10/2007	<0.04	0.0014	72	0.072	0.05	
BH03/02	26/11/2007	<0.04	0.0005	69	<0.005	<0.005	
BH03/02	04/01/2008	<0.04	0.0007	59	0.058	0.061	
BH03/02	30/01/2008	<0.04	0.002	66	0.081	0.06	
BH03/02	25/02/2008	<0.04	0.0019	66	0.12	0.12	
BH03/02	27/03/2008	<0.04	<0.0005	61	0.015	0.018	
BH03/02	28/04/2008	<0.04	<0.0005	60	0.011	0.011	
BH03/02	27/05/2008	<0.04	0.0007	58	0.006	<0.005	
BH03/02	19/06/2008	0.04	0.002	73	0.015	<0.005	
BH03/02	30/07/2008	<0.04	0.0015	71	0.053	0.044	
BH03/02	26/08/2008	<0.04	0.0005	66	<0.005	0.009	
BH03/02	30/09/2008	<0.04	0.0012	64	0.031	0.017	
BH03/02	31/10/2008	<0.04	0.0004	62	0.016	0.0258	
BH03/02	26/11/2008	0.05	0.0007	67	0.044	0.0481	
BH03/02	15/12/2008	0.23	0.0003	68	0.014	0.0163	
BH03/02	28/01/2009	0.19	<0.0003	71	0.006	0.0104	
BH03/02	24/02/2009	<0.04	0.0006	61	0.007	<0.0009	
BH03/02	20/03/2009	<0.04	<0.0003	66	0.031	0.0192	
BH03/02	20/04/2009	1.74	0.0012	54	0.087	0.0799	
BH03/02	27/05/2009	0.12	0.0009	69	0.096	0.0614	
BH03/02	23/06/2009	0.22	<0.0003	75	0.004	0.0038	
BH03/02	28/07/2009	<0.04	0.0024	69	0.14	0.0852	
BH03/02	26/08/2009	<0.04	0.0015	61	0.078	0.0773	
BH03/02	24/09/2009	0.1	0.0004	68		0.0306	<0.10
BH03/02	17/12/2009	0.12	0.0034	70		0.12	<0.10
BH03/02	24/03/2010	0.23	0.0015	74	0.072	0.056	0.23
BH03/02	23/09/2010	0.2	0.0027	72.2	0.203	0.092	0.12

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH04/02	25/07/2005	<0.04	<0.0005	61	0.054	0.032	
BH04/02	25/10/2005	<0.3	<0.0005	46	<0.005	<0.005	<1.0
BH04/02	04/01/2006	<0.3	<0.0005	52	0.082	0.043	
BH04/02	24/04/2006	<0.3	0.0005	55	0.006	0.008	
BH04/02	23/04/2007	<0.3	0.0005	57	0.007	0.006	
BH04/02	25/09/2007	0.23	0.0005	53	0.022	0.019	
BH04/02	26/11/2007	<0.04	0.0005	40	<0.005	<0.005	
BH04/02	04/01/2008	<0.04	<0.0005	38	0.017	0.014	
BH04/02	30/01/2008	<0.04	0.0005	55	0.023	0.014	
BH04/02	25/02/2008	<0.04	<0.0005	48	0.025	0.021	
BH04/02	27/03/2008	<0.04	<0.0005	46	0.011	0.01	
BH04/02	28/04/2008	<0.04	<0.0005	51	0.017	0.015	
BH04/02	27/05/2008	<0.04	<0.0005	13	<0.005	<0.005	
BH04/02	19/06/2008	0.21	0.0006	106	<0.005	<0.005	
BH04/02	30/07/2008	0.07	0.0005	97	0.022	0.027	
BH04/02	26/08/2008	0.14	0.0008	71	0.025	0.025	
BH04/02	30/09/2008	<0.04	0.0015	79	0.021	0.013	
BH04/02	31/10/2008	<0.04	0.0005	76	0.019	0.0351	
BH04/02	26/11/2008	<0.04	0.0007	72	0.032	0.0391	
BH04/02	15/12/2008	<0.04	0.001	62	0.035	0.0429	
BH04/02	28/01/2009	<0.04	<0.0003	60	0.012	0.0235	
BH04/02	24/02/2009	<0.04	0.0029	57	0.031	0.0037	
BH04/02	20/03/2009	<0.04	<0.0003	56	0.012	0.0101	
BH04/02	20/04/2009	<0.04	<0.0003	57	0.015	0.0146	
BH04/02	27/05/2009	<0.04	0.0005	67	0.021	0.0321	
BH04/02	23/06/2009	0.57	0.0011	84	0.026	0.0451	
BH04/02	28/07/2009	0.04	0.0003	86	0.014	0.0362	
BH04/02	26/08/2009	0.05	0.0005	80	0.013	0.0532	
BH04/02	24/09/2009	<0.04	<0.0003	91		0.0367	<0.10
BH04/02	17/12/2009	<0.04	0.0006	66		0.0263	<0.10
BH04/02	24/03/2010	<0.04	0.0005	70	0.024	0.0389	<0.10
BH04/02	05/01/2016	<0.30	<0.0001	86.8	<0.00002	0.0136	<4.00
BH04/02	22/04/2016	0.456	0.000226	76.4	0.00108	0.00907	<4.00
BH04/02	03/05/2017	<0.30	<0.00008	77.5	<0.0001	0.00474	<4.00
BH04/02	31/01/2018	<0.30	<0.00008	78.8	<0.0002	0.00354	<4.00
BH04/02	19/04/2018	<0.30	<0.00008	73.7	<0.0002	0.00458	<4.00
BH04/02	28/07/2021	<0.30	<0.00008	52	<0.0002	0.0173	<1.00
BH04/02	20/10/2021	0.1	<0.001	57.4	<0.001	0.009	<1.00
BH04/02	27/01/2022	<0.1	<0.001	85.9	<0.001	0.016	<1.00
BH04/02	04/05/2022	<0.30		77.5			<1.00
BH04/02	21/07/2022	<0.30	<0.00008	73.2	<0.0002	0.0118	<1.00
BH04/02	20/10/2022	<0.1	<0.0005	125	<0.0005	0.0057	<1.00
BH04/02	11/01/2023	0.6	<0.001	48.1	<0.001	0.014	<1.00
BH04/02	25/04/2023	<0.1	<0.001	52.5	<0.001	0.009	<1.00

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH05/02	29/05/2007	<0.04	0.003	31	0.093	0.1	
BH05/02	27/06/2007	<0.04	0.0005	24	0.01	0.008	
BH05/02	31/07/2007	0.04	0.0005	11	0.006	0.006	
BH05/02	29/08/2007	<0.04	0.0009	17	0.022	0.016	
BH05/02	25/09/2007	<0.04	0.0005	24	0.03	0.025	
BH05/02	30/10/2007	<0.04	0.0016	26	0.066	0.061	
BH05/02	26/11/2007	<0.04	0.0005	23	<0.005	<0.005	
BH05/02	04/01/2008	<0.04	<0.0005	23	0.023	0.021	
BH05/02	30/01/2008	<0.04	0.0008	17	0.044	0.041	
BH05/02	25/02/2008	<0.04	<0.0005	12	0.028	0.025	
BH05/02	27/03/2008	<0.04	<0.0005	13	0.016	0.016	
BH05/02	28/04/2008	<0.04	<0.0005	23	0.006	0.011	
BH05/02	27/05/2008	<0.04	<0.0005	20	<0.005	<0.005	
BH05/02	19/06/2008	0.04	<0.0005	11	<0.005	<0.005	
BH05/02	30/07/2008	<0.04	0.0008	23	0.013	0.011	
BH05/02	26/08/2008	<0.04	<0.0005	23	<0.005	<0.005	
BH05/02	30/09/2008	<0.04	0.0017	24	0.026	0.008	
BH05/02	31/10/2008	<0.04	0.0004	20	0.013	0.0154	
BH05/02	26/11/2008	<0.04	0.0005	14	0.013	0.0227	
BH05/02	15/12/2008	<0.04	<0.0003	10	0.005	0.0026	
BH05/02	28/01/2009	<0.04	<0.0003	14	0.007	0.0028	
BH05/02	24/02/2009	<0.04	0.0016	9	0.014	<0.0009	
BH05/02	20/03/2009	<0.04	0.0003	13	0.018	0.0128	
BH05/02	20/04/2009	<0.04	0.0012	22	0.03	0.0098	
BH05/02	27/05/2009	<0.04	0.0005	24	0.011	0.0134	
BH05/02	23/06/2009	<0.04	0.0022	22	0.037	0.0192	
BH05/02	28/07/2009	<0.04	0.0009	34	0.021	0.0164	
BH05/02	26/08/2009	<0.04	0.0008	37	0.028	0.0271	
BH05/02	24/09/2009	<0.04	<0.0003	43		0.0124	<0.10
BH05/02	17/12/2009	0.05	0.0004	15		0.0072	<0.10
BH05/02	24/03/2010	<0.04	0.0003	21	0.009	0.0101	<0.10
BH05/02	30/06/2010	<0.02	0.0034	9.6	<0.01	0.02	<3.0
BH05/02	23/09/2010	<0.04	<0.0006	28.7	0.009	0.034	<0.10
BH05/02	27/01/2011	<0.19	<0.00005	26.9	<0.005	<0.002	<0.10
BH05/02	27/04/2011	<0.19	<0.00005	30	<0.005	<0.002	<0.10
BH05/02	29/07/2011	<0.19	<0.00005	47.2	<0.005	<0.002	<0.10
BH05/02	27/10/2011	<0.19	<0.00005	45.8	<0.005	<0.004	0.28
BH05/02	26/01/2012	<0.27	<0.00005	28.53	<0.005	<0.002	0.19
BH05/02	30/04/2012	<0.27	<0.00005	25.5	<0.006	<0.003	<0.10
BH05/02	20/07/2012	<0.27	<0.00005	27.5	<0.006	<0.003	<0.10
BH05/02	22/10/2012	<0.27	<0.00005	22.9	<0.006	<0.003	<0.10
BH05/02	28/01/2013	<0.30	<0.0001	9.6	0.000048	0.00279	<4.00
BH05/02	22/04/2013	<0.30	<0.0001	14.6	<0.00002	0.00696	<4.00
BH05/02	30/07/2013	<0.30	<0.0001	29.6	0.000036	0.00435	<4.00
BH05/02	07/11/2013	<0.30	<0.0001	26.1	0.000029	0.00379	<4.00
BH05/02	28/01/2014	<0.30	<0.0001	25.2	<0.00002	0.00505	<4.00
BH05/02	09/04/2014	<0.30	<0.0001	19.2	<0.00002	0.00456	<4.00
BH05/02	09/07/2014	<0.30	<0.0001	27.4	<0.00002	0.00531	<4.00
BH05/02	28/10/2014	<0.30	<0.0001	29.5	0.000022	0.00718	<4.00
BH05/02	27/01/2015	<0.30	<0.0001	17.5	<0.00002	0.00296	<4.00
BH05/02	13/04/2015	<0.30	<0.0001	29.7	0.000069	0.00558	<4.00
BH05/02	17/07/2015	<0.30	<0.0001	29.4	<0.00002	0.00608	<4.00
BH05/02	08/10/2015	<0.30	<0.0001	20.7	0.000036	0.005	<4.00
BH05/02	05/01/2016	<0.30	<0.0001	27.6	0.000021	0.00374	<4.00
BH05/02	22/04/2016	<0.30	<0.0001	20.1	0.000407	0.00305	<4.00

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH06/02	25/07/2005	<0.04	<0.0005	18	0.026	0.016	
BH06/02	25/10/2005	<0.3	<0.0005	15	<0.005	<0.005	<1.0
BH06/02	04/01/2006	<0.3	<0.0005	18	<0.005	0.011	
BH06/02	24/04/2006	<0.3	0.0005	14	0.007	0.009	
BH06/02	24/07/2006	<0.3	0.0005	21	0.021	0.021	
BH06/02	27/10/2006	<0.3	0.0005	25	<0.005	<0.005	
BH06/02	31/01/2007	<0.3	0.005	32	0.057	0.055	
BH06/02	23/04/2007	<0.3	0.0005	14	<0.005	0.007	
BH06/02	29/05/2007	<0.04	0.001	28	0.022	0.032	
BH06/02	27/06/2007	<0.04	0.002	17	0.05	0.035	
BH06/02	31/07/2007	<0.04	0.0005	12	<0.005	0.006	
BH06/02	29/08/2007	<0.04	0.0008	15	0.015	0.011	
BH06/02	25/09/2007	<0.04	0.0006	13	0.038	0.039	
BH06/02	30/10/2007	<0.04	0.0011	21	0.039	0.044	
BH06/02	26/11/2007	<0.04	0.0005	22	<0.005	<0.005	
BH06/02	04/01/2008	<0.04	0.0006	22	0.061	0.073	
BH06/02	30/01/2008	<0.04	0.0009	27	0.048	0.042	
BH06/02	25/02/2008	<0.04	<0.0005	14	0.025	0.03	
BH06/02	27/03/2008	<0.04	<0.0005	14	0.006	0.008	
BH06/02	28/04/2008	<0.04	<0.0005	22	<0.005	<0.005	
BH06/02	27/05/2008	<0.04	<0.0005	13	<0.005	<0.005	
BH06/02	19/06/2008	<0.04	0.0022	11	0.019	<0.005	
BH06/02	30/07/2008	<0.04	0.0006	15	0.024	0.023	
BH06/02	26/08/2008	<0.04	<0.0005	11	0.009	0.01	
BH06/02	30/09/2008	<0.04	0.0019	14	0.017	<0.005	
BH06/02	31/10/2008	<0.04	0.0003	17	0.011	0.0205	
BH06/02	26/11/2008	<0.04	0.0008	16	0.028	0.0323	
BH06/02	15/12/2008	0.4	0.0003	46	0.008	0.0046	
BH06/02	28/01/2009	<0.04	<0.0003	78	0.002	0.0024	
BH06/02	24/02/2009	<0.04	0.003	33	0.034	<0.0009	
BH06/02	20/03/2009	<0.04	<0.0003	14	0.012	0.0071	
BH06/02	20/04/2009	<0.04	0.0011	39	0.023	0.0033	
BH06/02	27/05/2009	<0.04	<0.0003	37	0.014	0.0138	
BH06/02	23/06/2009	<0.04	0.003	25	0.048	0.017	
BH06/02	28/07/2009	<0.04	0.0003	20	0.017	0.0097	
BH06/02	26/08/2009	<0.04	<0.0003	13	0.017	0.0145	
BH06/02	24/09/2009	<0.04	0.0005	21		0.0202	<0.10
BH06/02	17/12/2009	<0.04	0.0009	24		0.0126	<0.10
BH06/02	24/03/2010	<0.04	0.0003	22	0.009	0.0088	<0.10
BH06/02	30/06/2010	<0.02	0.0029	<5.0	<0.01	0.02	<3.0
BH06/02	23/09/2010	<0.04	<0.0006	12.4	0.049	0.056	0.11
BH06/02	27/01/2011	0.27	0.00006	22.8	<0.005	0.022	<0.10
BH06/02	27/04/2011	<0.19	<0.00005	6.6	0.006	<0.002	<0.10
BH06/02	29/07/2011	<0.19	<0.00005	8	<0.005	<0.002	0.15
BH06/02	27/10/2011	<0.19	<0.00005	17.8	<0.005	<0.004	0.14
BH06/02	26/01/2012	<0.27	<0.00005	44.31	<0.005	0.003	0.13
BH06/02	30/04/2012	10.3	0.00036	27.7	0.019	0.004	<0.10
BH06/02	20/07/2012	5.8	0.0002	23.1	<0.006	0.006	0.1
BH06/02	22/10/2012	0.28	<0.00005	18.6	<0.006	<0.003	0.16
BH06/02	28/01/2013	<0.30	<0.0001	15.4	0.000069	0.00672	<4.00
BH06/02	22/04/2013	0.388	<0.0001	16.3	<0.00002	0.00693	<4.00
BH06/02	30/07/2013	<0.30	<0.0001	49.3	0.000045	0.00945	<4.00
BH06/02	07/11/2013	<0.30	<0.0001	17.3	0.000059	0.00422	<4.00
BH06/02	28/01/2014	<0.30	<0.0001	18.6	0.000411	0.00578	<4.00
BH06/02	09/04/2014	<0.30	<0.0001	21.7	0.000038	0.0073	<4.00
BH06/02	09/07/2014	<0.30	<0.0001	14.1	<0.00002	0.00526	<4.00
BH06/02	28/10/2014	<0.30	<0.0001	42.8	0.000047	0.00523	<4.00
BH06/02	27/01/2015	<0.30	<0.0001	25.4	<0.00002	0.00259	<4.00
BH06/02	13/04/2015	<0.30	<0.0001	20.3	0.000025	0.00302	<4.00
BH06/02	17/07/2015	<0.30	<0.0001	18.7	0.000236	0.00446	<4.00
BH06/02	08/10/2015	<0.30	<0.0001	15.4	<0.00002	0.00287	<4.00
BH06/02	05/01/2016	<0.30	<0.0001	18.7	0.000038	0.00614	<4.00
BH06/02	22/04/2016	<0.30	0.000152	19.7	0.000396	0.00281	<4.00
BH06/02	25/07/2016	<0.30	<0.00008	6.8	<0.0001	0.000742	<4.00
BH06/02	01/05/2020	<0.30	<0.00008	48.8	<0.0002	0.00204	<4.00
BH06/02	01/07/2020	<0.30	<0.00008	31.1	<0.0002	0.00178	<4.00
BH06/02	19/11/2020	<0.30	<0.00008	19.6	0.000388	0.00331	<4.00
BH06/02	27/01/2021	<0.30	<0.00008	48.4	0.0108	0.00465	<4.00
BH06/02	13/04/2021	<0.30	<0.00008	14.2	<0.0002	0.00218	<4.00
BH06/02	28/07/2021	<0.30	<0.00008	22.1	<0.0002	0.00333	<1.00
BH06/02	20/10/2021	0.3	<0.001	28.4	<0.001	<0.005	<1.00
BH06/02	12/01/2022	0.1	<0.001	31.2	<0.001	<0.005	<1.00
BH06/02	04/05/2022	<0.30	<0.00008	4.4	<0.0002	0.00172	<1.00
BH06/02	21/07/2022	<0.30	<0.00008	3.5	<0.0002	0.00146	<1.00
BH06/02	20/10/2022	0.3	<0.0005	7.6	<0.0005	0.0023	<1.00
BH06/02	24/04/2023	<0.1	<0.001	31.1	<0.001	<0.005	<1.00

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH01/09	24/09/2009	<0.04	<0.0003	78		0.0096	<0.10
BH01/09	20/10/2009	<0.04	<0.0003	86		0.0101	<0.10
BH01/09	23/11/2009	<0.04	<0.0003	74		0.0169	<0.10
BH01/09	17/12/2009	<0.04	0.0007	77		0.0105	<0.10
BH01/09	28/01/2010	0.06	0.0016	80		0.0118	0.11
BH01/09	26/02/2010	<0.04	<0.0003	77	<0.002	0.0051	<0.10
BH01/09	24/03/2010	<0.04	<0.0003	82	0.003	0.0099	<0.10
BH01/09	30/04/2010	<0.04	<0.0003	81	0.008	0.0065	<0.10
BH01/09	19/05/2010	0.056	0.0033	76	<0.01	0.02	<3.0
BH01/09	30/06/2010	0.1	0.0021	93	<0.01	<0.01	<3.0
BH01/09	07/07/2010	0.094	<0.0003	78	<0.01	0.01	<3.0
BH01/09	23/09/2010	0.2	0.0013	73.7	0.021	0.034	<0.10
BH01/09	30/11/2010	<0.19	0.00008	85.3	<0.005	0.019	0.11
BH01/09	22/12/2010	<0.19	0.00009	78.3	0.0067	0.023	<0.10
BH01/09	27/01/2011	0.23	0.00007	76.8	<0.005	0.032	<0.10
BH01/09	14/02/2011	<0.19	0.00007	77.1	<0.005	0.024	<0.10
BH01/09	20/04/2011	<0.19	<0.00005	84.4	<0.005	0.006	<0.10
BH01/09	27/04/2011	0.51	<0.00005	78.4	<0.005	0.023	0.13
BH01/09	12/05/2011	0.29	<0.00005	79.2	<0.005	0.023	<0.10
BH01/09	09/06/2011	<0.19	<0.00005	78.4	<0.005	0.027	<0.10
BH01/09	29/07/2011	<0.19	<0.00005	81.1	0.006	<0.002	<0.10
BH01/09	23/08/2011	<0.19	<0.00005	84.2	<0.005	0.007	<0.10
BH01/09	27/09/2011	<0.19	<0.00005	94.4	0.008	<0.002	0.1
BH01/09	27/10/2011	<0.19	<0.00005	96.5	<0.005	0.008	<0.10
BH01/09	30/11/2011	<0.19	0.0001	103	<0.005	0.01	0.17
BH01/09	21/12/2011	<0.19	0.00013	110	<0.005	0.015	<0.10
BH01/09	26/01/2012	<0.27	0.00009	110	<0.005	0.012	<0.10
BH01/09	15/02/2012	<0.27	<0.00005	121	<0.005	0.007	<0.10
BH01/09	30/04/2012	<0.27	<0.00005	109	<0.006	0.009	<0.10
BH01/09	28/05/2012	<0.27	<0.00005	126	<0.006	0.011	<0.10
BH01/09	12/06/2012	<0.27	0.00013	142	<0.006	0.016	0.1
BH01/09	20/07/2012	0.36	0.00008	132	<0.006	0.012	0.16
BH01/09	23/08/2012	0.31	0.00007	127	<0.006	0.065	1.23
BH01/09	26/09/2012	0.38	<0.00005	123	<0.006	0.011	<0.10
BH01/09	22/10/2012	<0.27	<0.00005	122	<0.006	0.008	<0.10
BH01/09	28/01/2013	<0.30	<0.0001	112	0.000071	0.00958	<4.00
BH01/09	22/04/2013	0.451	<0.0001	102	<0.00002	0.0134	<4.00
BH01/09	30/07/2013	0.739	<0.0001	111	0.000049	0.0157	<4.00
BH01/09	09/04/2014	0.553	<0.0001	110	<0.00002	0.0121	<4.00
BH01/09	09/07/2014	0.899	<0.0001	107	<0.00002	0.0125	<4.00
BH01/09	28/10/2014	0.926	<0.0001	95.4	0.00005	0.0129	<4.00
BH01/09	27/01/2015	0.519	<0.0001	92.6	0.00004	0.0113	<4.00
BH01/09	13/04/2015	3.01	<0.0001	86.1	<0.00002	0.00957	<4.00

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH02/09	24/09/2009	0.04	<0.0003	9		0.0031	<0.10
BH02/09	20/10/2009	0.04	0.0028	10		0.0009	<0.10
BH02/09	23/11/2009	<0.04	<0.0003	17		<0.0009	<0.10
BH02/09	17/12/2009	0.06	0.0003	11		0.0014	<0.10
BH02/09	29/01/2010	0.07	0.0009	10		<0.0009	<0.10
BH02/09	26/02/2010	0.04	<0.0003	18	<0.002	<0.0009	<0.10
BH02/09	24/03/2010	<0.04	<0.0003	26	0.009	0.0015	<0.10
BH02/09	30/04/2010	<0.04	<0.0003	81	0.009	0.0011	<0.10
BH02/09	19/05/2010	<0.02	0.0015	<5.0	<0.01	<0.01	<3.0
BH02/09	30/06/2010	0.29	0.0016	50	<0.01	<0.01	<3.0
BH02/09	07/07/2010	0.09	<0.0003	44	<0.01	<0.01	<3.0
BH02/09	23/09/2010	0.04	<0.0006	11.9	<0.005	0.008	0.11
BH02/09	30/11/2010	<0.19	0.00007	16.9	0.0063	<0.002	0.29
BH02/09	22/12/2010	<0.19	0.00006	20.1	<0.005	<0.002	<0.10
BH02/09	27/01/2011	<0.19	0.00006	9.8	<0.005	0.003	<0.10
BH02/09	14/02/2011	<0.19	0.00005	7.6	<0.005	0.003	<0.10
BH02/09	20/04/2011	<0.19	<0.00005	74.6	<0.005	<0.002	<0.10
BH02/09	27/04/2011	0.25	<0.00005	9.3	<0.005	<0.002	<0.10
BH02/09	12/05/2011	<0.19	<0.00005	18	<0.005	0.002	<0.10
BH02/09	09/06/2011	<0.19	<0.00005	16.3	<0.005	0.002	<0.10
BH02/09	29/07/2011	<0.19	<0.00005	23.9	<0.005	<0.002	<0.10
BH02/09	23/08/2011	<0.19	<0.00005	14.5	0.006	<0.002	<0.10
BH02/09	27/09/2011	<0.19	<0.00005	17.1	0.009	<0.002	<0.10
BH02/09	27/10/2011	<0.19	<0.00005	18.3	<0.005	<0.004	<0.10
BH02/09	30/11/2011	<0.19	<0.00005	25.8	<0.005	<0.002	0.18
BH02/09	21/12/2011	<0.19	<0.00009	25.1	<0.005	0.004	0.11
BH02/09	26/01/2012	<0.27	<0.00005	26.73	<0.005	<0.002	<0.10
BH02/09	15/02/2012	<0.27	<0.00005	30.7	<0.005	<0.002	<0.10
BH02/09	30/04/2012	<0.27	<0.00005	25.4	<0.006	<0.003	<0.10
BH02/09	28/05/2012	<0.27	<0.00005	33.7	<0.006	<0.003	<0.10
BH02/09	12/06/2012	<0.27	<0.00005	28.5	<0.006	<0.003	<0.10
BH02/09	20/07/2012	<0.27	<0.00005	25.7	<0.006	<0.003	<0.10
BH02/09	23/08/2012	<0.27	<0.00005	22.5	<0.006	<0.003	<0.10
BH02/09	26/09/2012	<0.27	<0.00005	15.5	<0.006	<0.003	<0.10
BH02/09	22/10/2012	<0.27	<0.00005	12.4	<0.006	<0.003	0.1
BH02/09	28/01/2013	<0.30	<0.0001	8.8	0.000067	0.0035	<4.00
BH02/09	22/04/2013	<0.30	0.000116	11.5	<0.00002	0.0118	<4.00
BH02/09	30/07/2013	0.359	<0.0001	12.2	0.000085	0.0107	<4.00
BH02/09	07/11/2013	<0.30	<0.0001	17.1	0.000204	0.00367	<4.00
BH02/09	28/01/2014	<0.30	<0.0001	17.8	0.000038	0.00473	<4.00
BH02/09	09/04/2014	<0.30	<0.0001	19.5	0.000064	0.00333	<4.00
BH02/09	09/07/2014	<0.30	<0.0001	22.5	<0.00002	0.00208	<4.00
BH02/09	28/10/2014	<0.30	<0.0001	22	0.000025	0.00253	<4.00
BH02/09	27/01/2015	<0.30	<0.0001	47.4	<0.00002	0.00231	<4.00
BH02/09	13/04/2015	5.3	<0.0001	42.8	<0.00002	0.0031	<4.00
BH02/09	17/07/2015	<0.30	<0.0001	32.8	<0.00002	0.00414	<4.00
BH02/09	08/10/2015	<0.30	<0.0001	37.3	<0.00002	0.00349	<4.00
BH02/09	05/01/2016	<0.30	<0.0001	35.3	<0.00002	0.00371	<4.00
BH02/09	22/04/2016	<0.30	0.000103	24.7	0.00102	0.00183	<4.00
BH02/09	25/07/2016	<0.30	<0.00008	31.7	<0.0001	0.00146	<4.00
BH02/09	27/10/2016	<0.20	<0.00008	33.6	<0.0001	0.000841	<4.00
BH02/09	26/01/2017	<0.30	<0.00008	29.6	<0.0001	0.00104	<4.00
BH02/09	03/05/2017	<0.30	<0.00008	41.3	0.000628	0.00272	<4.00
BH02/09	17/07/2017	<0.30	<0.00008	42.9	<0.0002	0.00124	<4.00
BH02/09	26/10/2017	<0.30	<0.00008	47.3	<0.0002	0.0722	<4.00
BH02/09	31/01/2018	<0.30	<0.00008	53	<0.0002	0.00277	<4.00
BH02/09	19/04/2018	<0.30	<0.00008	46.9	<0.0002	0.012	<4.00
BH02/09	12/07/2018	<0.30	<0.00008	47.4	<0.0002	<0.0004	<4.00
BH02/09	04/10/2018	<0.30	<0.00008	45.9	<0.0002	<0.0004	<4.00
BH02/09	30/01/2019	<0.30	<0.00008	45.2	<0.0002	0.00159	<4.00
BH02/09	22/02/2019	<0.30	<0.00008	45.6	<0.0002	0.000941	<4.00
BH02/09	01/05/2019	<0.30	<0.00008	44.7	<0.0002	0.00222	<4.00
BH02/09	01/08/2019	0.1	<0.00004	49	0.00004	0.0017	<1.00
BH02/09	06/11/2019	1.5	<0.00008	46	<0.00001	0.0028	<1.00
BH02/09	05/02/2020	<0.30	<0.00008	52.8	<0.0002	0.00202	<4.00
BH02/09	01/05/2020	<0.30	0.000087	31.2	0.00049	0.00476	<4.00
BH02/09	01/07/2020	<0.30	<0.00008	48.1	<0.0002	0.00162	<4.00
BH02/09	19/11/2020	<0.30	<0.00008	45.9	<0.0002	0.00114	<4.00
BH02/09	27/01/2021	<0.30	<0.00008	46.5	<0.0002	0.000752	<4.00
BH02/09	13/04/2021	<0.30	<0.00008	44.7	<0.0002	0.000894	<4.00
BH02/09	28/07/2021	<0.30	<0.00008	48	<0.0002	<0.0004	<1.00
BH02/09	20/10/2021	0.3	<0.001	44.4	<0.001	<0.005	<1.00
BH02/09	12/01/2022	0.1	<0.001	40.9	<0.001	<0.005	<1.00
BH02/09	04/05/2022	<0.30		46.6			<1.00
BH02/09	21/07/2022	<0.30	<0.00008	48.1		0.00133	<1.00
BH02/09	20/10/2022	0.3	<0.0005	45.3		0.0007	<1.00
BH02/09	11/01/2023	0.1	<0.001	43	<0.001	<0.005	<1.00
BH02/09	24/04/2023	<0.1	<0.001	57.3	<0.001	<0.005	<1.00
BH02/09	05/10/2023	0.1	<0.001	65.7	<0.001	<0.005	<1.00
BH02/09	23/02/2024	0.1	<0.001	40.6	<0.001	<0.005	<1.00
BH02/09	12/11/2024	0.051	<0.0001	34.3	<0.0006	0.00494	< 1.0

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH03/09	24/09/2009	<0.04	<0.0003	25		0.0026	<0.10
BH03/09	20/10/2009	<0.04	0.0028	58		0.0194	<0.10
BH03/09	23/11/2009	<0.04	<0.0003	51		0.0158	<0.10
BH03/09	17/12/2009	0.05	0.0006	52		0.0048	<0.10
BH03/09	28/01/2010	0.05	0.0018			0.0093	<0.10
BH03/09	26/02/2010	0.04	<0.0003	53	<0.002	<0.0009	<0.10
BH03/09	24/03/2010	<0.04	0.0004	57	0.026	0.0173	<0.10
BH03/09	30/04/2010	<0.04	0.0007	58	0.026	0.0157	<0.10
BH03/09	19/05/2010	<0.02	0.0017	50	<0.01	<0.01	<3.0
BH03/09	30/06/2010	0.03	0.0017	63	<0.01	<0.01	<3.0
BH03/09	07/07/2010	0.039	<0.0003	59	<0.01	<0.01	<3.0
BH03/09	23/09/2010	0.07	<0.0006	62.3	0.006	0.013	<0.10
BH03/09	30/11/2010	<0.19	0.00006	60.5	<0.005	<0.002	<0.10
BH03/09	22/12/2010	<0.19	0.00008	56.2	<0.005	0.006	<0.10
BH03/09	27/01/2011	<0.19	0.00005	56.1	<0.005	0.005	<0.10
BH03/09	14/02/2011	<0.19	0.00005	59.5	<0.005	0.005	<0.10
BH03/09	20/04/2011	<0.19	<0.00005	70.4	<0.005	0.007	<0.10
BH03/09	27/04/2011	<0.19	<0.00005	66.6	0.006	0.002	<0.10
BH03/09	12/05/2011	<0.19	<0.00005	72.4	<0.005	0.005	<0.10
BH03/09	26/01/2012	<0.27	<0.00005	42.05	<0.005	0.005	0.78
BH03/09	15/02/2012	<0.27	0.00005	46.3	<0.005	0.003	<0.10
BH03/09	30/04/2012	<0.27	<0.00005	32.5	<0.006	0.004	<0.10
BH03/09	28/05/2012	<0.27	<0.00005	38.9	<0.006	0.004	<0.10
BH03/09	12/06/2012	<0.27	<0.00005	41.4	<0.006	0.005	<0.10
BH03/09	20/07/2012	<0.27	<0.00005	33.5	<0.006	<0.003	<0.10
BH03/09	23/08/2012	<0.27	<0.00005	32.7	<0.006	0.004	<0.10
BH03/09	26/09/2012	<0.27	<0.00005	30.7	<0.006	<0.003	<0.10
BH03/09	22/10/2012	<0.27	<0.00005	37.2	<0.006	<0.003	<0.10
BH03/09	28/01/2013	<0.30	<0.0001	26.7	0.000023	0.00518	<4.00
BH03/09	22/04/2013	<0.30	<0.0001	33	0.000298	0.00396	<4.00
BH03/09	30/07/2013	<0.30	<0.0001	26.1	0.000028	0.00352	<4.00
BH03/09	07/11/2013	<0.30	<0.0001	22.5	0.000028	0.00276	<4.00
BH03/09	28/01/2014	<0.30	<0.0001	21.6	<0.00002	0.00344	<4.00
BH03/09	09/04/2014	<0.30	<0.0001	23	<0.00002	0.00297	<4.00
BH03/09	28/10/2014	0.573	<0.0001	28.9	0.000025	0.00222	<4.00
BH03/09	27/01/2015	0.665	<0.0001	32.6	<0.00002	0.00329	<4.00
BH03/09	13/04/2015	<0.30	<0.0001	30.4	<0.00002	0.00321	<4.00
BH03/09	17/07/2015	0.311	<0.0001	33.4	<0.00002	0.00282	<4.00
BH03/09	08/10/2015	<0.30	<0.0001	33.6	<0.00002	0.00143	<4.00
BH03/09	05/01/2016	<0.30	<0.0001	35.0	<0.00002	0.00263	<4.00
BH03/09	22/04/2016	<0.30	<0.0001	35.0	0.000422	0.00196	<4.00
BH03/09	27/10/2016	<0.20	<0.00008	33.3	<0.0001	0.000726	<4.00
BH03/09	26/01/2017	<0.30	<0.00008	28.7	<0.0001	0.00103	<4.00
BH03/09	03/05/2017	<0.30	<0.00008	35.3	<0.0001	0.000624	<4.00

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH04/09	24/09/2009	<0.04	<0.0003	24		0.017	<0.10
BH04/09	20/10/2009	<0.04	0.0029	23		0.0063	<0.10
BH04/09	23/11/2009	0.14	<0.0003	19		<0.0009	<0.10
BH04/09	17/12/2009	0.05	<0.0003	24		0.0042	<0.10
BH04/09	28/01/2010	<0.04	0.0017	25		0.0017	<0.10
BH04/09	26/02/2010	<0.04	<0.0003	37	<0.002	<0.0009	
BH04/09	24/03/2010	<0.04	0.0005	28	0.024	0.0043	<0.10
BH04/09	30/04/2010	<0.04	0.0004	25	0.016	<0.0009	<0.10
BH04/09	19/05/2010	<0.02	0.0019	50	<0.01	<0.01	<3.0
BH04/09	30/06/2010	<0.02	0.0022	19	<0.01	<0.01	<3.0
BH04/09	07/07/2010	<0.02	<0.0003	17	<0.01	<0.01	<3.0
BH04/09	23/09/2010	<0.04	<0.0006	59	<0.005	0.01	<0.10
BH04/09	30/11/2010	<0.19	<0.00005	27	<0.005	<0.002	<0.10
BH04/09	22/12/2010	<0.19	<0.00005	26.8	<0.005	<0.002	<0.20
BH04/09	27/01/2011	<0.19	<0.00005	27.6	<0.005	0.006	<0.10
BH04/09	14/02/2011	<0.19	<0.00005	25.7	<0.005	0.003	<0.10
BH04/09	20/04/2011	<0.19	<0.00005	32.1	<0.005	<0.002	<0.10
BH04/09	27/04/2011	<0.19	<0.00005	27.8	0.005	<0.002	<0.10
BH04/09	12/05/2011	<0.19	<0.00005	63.6	<0.005	0.003	<0.10
BH04/09	09/06/2011	<0.19	<0.00005	64.6	0.009	0.008	0.15
BH04/09	29/07/2011	<0.19	<0.00005	62	<0.005	<0.002	<0.10
BH04/09	23/08/2011	<0.19	<0.00005	61.9	<0.005	<0.002	<0.10
BH04/09	27/09/2011	<0.19	<0.00005	60.6	0.006	<0.002	<0.10
BH04/09	27/10/2011	<0.19	<0.00005	60.5	<0.005	<0.004	<0.10
BH04/09	30/11/2011	0.19	<0.00005	53.3	<0.005	<0.002	0.13
BH04/09	21/12/2011	<0.19	0.00007	39	<0.005	0.004	<0.10
BH04/09	26/01/2012	<0.27	<0.00005	37.98	<0.005	<0.002	<0.10
BH04/09	15/02/2012	<0.27	<0.0005	45.8	<0.005	<0.002	<0.10
BH04/09	30/04/2012	<0.27	<0.00005	27	<0.006	<0.003	<0.10
BH04/09	28/05/2012	<0.27	<0.00005	28.4	<0.006	<0.003	<0.10
BH04/09	12/06/2012	<0.27	<0.00005	28.4	<0.006	<0.003	<0.10
BH04/09	20/07/2012	<0.27	<0.00005	28.8	<0.006	<0.003	<0.10
BH04/09	23/08/2012	<0.27	<0.00005	28.4	<0.006	<0.003	<0.10
BH04/09	26/09/2012	<0.27	<0.00005	26.9	<0.006	<0.003	<0.10
BH04/09	22/10/2012	<0.27	<0.00005	30.1	<0.006	<0.003	<0.10
BH04/09	28/01/2013	0.635	<0.0001	117	0.000081	0.0131	<4.00
BH04/09	22/04/2013	<0.30	<0.0001	28.9	0.000086	0.00324	<4.00
BH04/09	30/07/2013	0.355	<0.0001	28.6	0.000078	0.00325	<4.00
BH04/09	07/11/2013	0.438	<0.0001	28	0.000035	0.00222	<4.00
BH04/09	28/01/2014	<0.30	<0.0001	32.9	0.000076	0.00487	<4.00
BH04/09	09/04/2014	<0.30	<0.0001	27.9	0.00002	0.00252	<4.00
BH04/09	09/07/2014	0.368	<0.0001	28.3	<0.00002	0.00152	<4.00
BH04/09	28/10/2014	0.384	<0.0001	24.8	0.000028	0.00174	<4.00
BH04/09	27/01/2015	0.575	<0.0001	23	<0.00002	0.00144	<4.00
BH04/09	13/04/2015	0.985	<0.0001	24.8	0.000044	0.00144	<4.00
BH04/09	17/07/2015	0.57	<0.0001	26.2	<0.00002	0.00135	<4.00
BH04/09	08/10/2015	0.422	<0.0001	23.7	<0.00002	0.000847	<4.00
BH04/09	05/01/2016	<0.30	<0.0001	66.1	<0.00002	0.00644	<4.00
BH04/09	22/04/2016	<0.30	0.000121	75.3	0.000518	0.00799	<4.00
BH04/09	25/07/2016	<0.30	<0.00008	79.5	<0.0001	0.00381	<4.00
BH04/09	27/10/2016	<0.20	<0.00008	63	<0.0001	0.00274	<4.00
BH04/09	26/01/2017	<0.30	<0.00008	52.4	0.000112	0.00089	<4.00
BH04/09	03/05/2017	<0.30	<0.00008	71.4	0.00188	0.00542	<4.00
BH04/09	17/07/2017	<0.30	<0.00008	75.8	<0.0002	0.00368	<4.00
BH04/09	26/10/2017	0.589	<0.00008	61.6	<0.0002	0.000924	<4.00
BH04/09	31/01/2018	<0.30	<0.00008	32.7	<0.0002	0.00106	<4.00
BH04/09	19/04/2018	0.339	<0.00008	29.4	<0.0002	0.0017	<4.00
BH04/09	12/07/2018	0.312	<0.00008	27.3	<0.0002	<0.0004	<4.00
BH04/09	04/10/2018	0.49	<0.00008	25.9	<0.0002	<0.0004	<4.00
BH04/09	30/01/2019	0.415	<0.00008	28.4	<0.0002	0.000655	<4.00
BH04/09	22/02/2019	0.404	<0.00008	24.1	<0.0002	<0.0004	<4.00
BH04/09	01/05/2019	0.63	<0.00008	27.9	<0.0002	0.000622	<4.00
BH04/09	01/08/2019	<0.1	<0.00004	26	0.00016	0.0011	<1.00
BH04/09	06/11/2019	1.4	<0.00008	31	<0.00001	0.0008	<1.00
BH04/09	05/02/2020	0.428	<0.00008	34.5	<0.0002	<0.0004	<4.00
BH04/09	18/05/2020	0.476	<0.00008	33.5	<0.0002	<0.0004	<4.00
BH04/09	01/07/2020	<0.30	<0.00008	33.6	<0.0002	<0.0004	<4.00
BH04/09	19/11/2020	0.427	<0.00008	36.3	<0.0002	<0.0004	<4.00
BH04/09	27/01/2021	<0.30	<0.00008	35.8	<0.0002	<0.0004	<4.00
BH04/09	13/04/2021	<0.30	<0.00008	31.1	<0.0002	<0.0004	<4.00
BH04/09	28/07/2021	<0.30	<0.00008	33.3	<0.0002	<0.0004	<1.00
BH04/09	20/10/2021	0.6	<0.001	31.1	<0.001	<0.005	<1.00
BH04/09	27/01/2022	<0.1	<0.001	33.2	<0.001	<0.005	<1.00
BH04/09	04/05/2022	<0.30		32.6			<1.00
BH04/09	21/07/2022	0.455	<0.00008	32.5	<0.0002	<0.0004	<1.00
BH04/09	20/10/2022	<0.1	<0.0005	68.6	<0.0005	0.0044	<1.00
BH04/09	11/01/2023	0.1	<0.001	54.7	<0.001	0.023	<1.00
BH04/09	25/04/2023	<0.1	<0.001	32.4	<0.001	0.005	<1.00
BH04/09	05/10/2023	0.1	<0.001	77.3	<0.001	<0.005	<1.00
BH04/09	21/02/2024	0.3	<0.001	68.4	<0.001	<0.005	<1.00
BH04/09	12/11/2024	0.272	<0.0001	62.6	<0.0006	0.00197	< 1.0

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH05/09	24/09/2009	<0.04	<0.0003	45		0.0069	<0.10
BH05/09	20/10/2009	<0.04	0.0026	58		0.0212	<0.10
BH05/09	23/11/2009	<0.04	<0.0003	66		0.0229	<0.10
BH05/09	17/12/2009	0.2	<0.0003	69		0.0175	<0.10
BH05/09	28/01/2010	0.05	0.0024	77		0.0236	0.11
BH05/09	26/02/2010	<0.04	0.0003	69	<0.002	<0.0009	<0.10
BH05/09	24/03/2010	<0.04	<0.0003	74	0.008	0.0132	<0.10
BH05/09	30/04/2010	<0.04	<0.0003	71	0.009	0.0016	<0.10
BH05/09	19/05/2010	<0.02	0.0017	14	<0.01	<0.01	<3.0
BH05/09	30/06/2010	0.034	0.0019	63	<0.01	<0.01	<3.0
BH05/09	07/07/2010	<0.02	<0.0003	73	<0.01	0.02	<3.0
BH05/09	23/09/2010	<0.4	<0.0006	69.5	0.01	0.019	<0.10
BH05/09	30/11/2010	<0.19	<0.00005	71.6	<0.005	<0.002	0.18
BH05/09	22/12/2010	<0.19	<0.00005	70.5	<0.005	0.003	<0.10
BH05/09	27/01/2011	<0.19	0.00006	71.1	<0.005	0.003	<0.10
BH05/09	14/02/2011	<0.19	0.00005	72.9	<0.005	0.012	<0.10
BH05/09	20/04/2011	<0.19	<0.00005	90.5	<0.005	0.005	0.26
BH05/09	27/04/2011	<0.19	<0.00005	71.6	<0.005	0.006	0.11
BH05/09	12/05/2011	<0.19	<0.00005	79.1	<0.005	0.003	0.11
BH05/09	09/06/2011	<0.19	<0.00005	76.5	<0.005	0.005	<0.10

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH01/11A	21/12/2011	<0.19	0.00008	282	<0.005	0.023	0.18
BH01/11A	26/01/2012	<0.27	<0.00005	302	<0.005	0.024	0.13
BH01/11A	15/02/2012	<0.27	<0.0005	311	<0.005	0.022	<0.10
BH01/11A	30/04/2012	<0.27	0.00006	326	<0.006	0.026	<0.10
BH01/11A	30/07/2013	<0.30	<0.0001	227	0.000037	0.0339	<4.00
BH01/11A	12/11/2013	<0.30	<0.0001	210	0.000062	0.0215	<4.00
BH01/11A	28/01/2014	<0.30	<0.0001	228	0.000044	0.0234	<4.00
BH01/11A	09/04/2014	<0.30	<0.0001	99.7	0.000281	0.0114	<4.00

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH02/11A	26/01/2012	<0.27	0.00007	151	<0.005	0.022	0.39
BH02/11A	15/02/2012	<0.27	<0.0005	151	<0.005	0.028	0.16
BH02/11A	30/04/2012	<0.27	<0.00005	59.1	<0.006	0.005	0.85
BH02/11A	28/05/2012	<0.27	<0.00005	39	0.006	0.019	<0.10
BH02/11A	23/08/2012	<0.27	0.00006	120	<0.006	0.056	0.55
BH02/11A	28/01/2013	<0.30	<0.0001	83	0.000119	0.0181	<4.00
BH02/11A	22/04/2013	<0.30	<0.0001	18	0.00011	0.00241	<4.00
BH02/11A	30/07/2013	<0.30	<0.0001	17.6	0.000021	0.0154	<4.00
BH02/11A	12/11/2013	0.481	<0.0001	16.9	0.000039	0.00236	<4.00
BH02/11A	09/04/2014	<0.30	<0.0001	17.6	0.00006	0.00273	<4.00
BH02/11A	22/02/2019	<0.30	<0.00008	21.7	<0.0002	0.000984	<4.00
BH02/11A	01/05/2019	0.364	0.000348	22.5	<0.0002	<0.0004	<4.00
BH02/11A	01/08/2019	<0.1	<0.00004	26	0.0001	0.0037	<1.00
BH02/11A	01/07/2020	4.58	<0.00008	21.1	<0.0002	0.000958	<4.00
BH02/11A	19/11/2020	1.88	<0.00008	27	<0.0002	0.00109	<4.00
BH02/11A	27/01/2021	<0.30	<0.00008	20.1	<0.0002	<0.0004	<4.00
BH02/11A	13/04/2021	<0.30	<0.00008	185	0.000501	0.0263	<4.00
BH02/11A	28/07/2021	<0.30	<0.00008	57.1	<0.0002	0.0112	<1.00
BH02/11A	20/10/2021	0.1	<0.001	37.1	<0.001	0.011	<1.00
BH02/11A	27/01/2022	0.1	<0.001	28.9	<0.001	0.016	<1.00
BH02/11A	04/05/2022	<0.30		28.5			<1.00
BH02/11A	21/07/2022	<0.30	<0.00008	25.6	<0.0002	0.00824	<1.00
BH02/11A	20/10/2022	1.3	<0.0005	23.1	<0.0005	0.004	<1.00
BH02/11A	26/04/2023	<0.1	<0.001	32.4	<0.001	<0.005	<1.00

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH02/11B	27/01/2021	<0.30	<0.00008	37.4	<0.0002	0.00369	<4.00
BH02/11B	13/04/2021	<0.30	<0.00008	94.8	<0.0002	0.00238	<4.00
BH02/11B	28/07/2021	<0.30	0.00008	69.9	0.000442	0.0111	<1.00
BH02/11B	20/10/2021	0.3	<0.001	35.5	<0.001	0.009	<1.00
BH02/11B	27/01/2022	0.3	<0.001	130	<0.001	0.009	<1.00
BH02/11B	04/05/2022	0.33		145			<1.00
BH02/11B	21/07/2022	0.377		123			<1.00

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH03/11A	21/12/2011	<0.19	0.00008	29.6	<0.005	0.006	0.11
BH03/11A	26/01/2012	<0.27	<0.00005	30.22	<0.005	0.004	<0.10
BH03/11A	15/02/2012	<0.27	<0.0005	27.2	<0.005	<0.002	<0.10
BH03/11A	30/04/2012	<0.27	<0.00005	25.5	<0.006	<0.003	<0.10
BH03/11A	28/05/2012	<0.27	<0.00005	25.5	<0.006	0.004	<0.10
BH03/11A	12/06/2012	<0.27	<0.00005	25.5	<0.006	<0.003	<0.10
BH03/11A	20/07/2012	0.98	<0.00005	26	<0.006	<0.003	<0.10
BH03/11A	23/08/2012	<0.27	<0.00005	24.9	<0.006	<0.003	<0.10
BH03/11A	26/09/2012	<0.27	<0.00005	22.8	<0.006	<0.003	<0.10
BH03/11A	22/10/2012	<0.27	<0.00005	29.2	<0.006	<0.003	<0.10
BH03/11A	28/01/2013	<0.30	<0.0001	24.2	0.00002	0.00382	<4.00
BH03/11A	22/04/2013	<0.30	<0.0001	26.2	0.000067	0.00147	<4.00
BH03/11A	30/07/2013	<0.30	<0.0001	25.8	0.000421	0.0122	<4.00
BH03/11A	12/11/2013	0.302	<0.0001	26.1	0.000042	0.00313	<4.00
BH03/11A	28/01/2014	<0.30	<0.0001	27.9	<0.00002	0.00508	<4.00
BH03/11A	09/04/2014	<0.30	<0.0001	29.6	0.000038	0.00851	<4.00
BH03/11A	28/10/2014	<0.30	<0.0001	27.9	0.000027	0.00296	<4.00
BH03/11A	27/01/2015	0.405	<0.0001	26.7	<0.00002	0.00476	<4.00
BH03/11A	13/04/2015	0.315	<0.0001	27.9	0.000046	0.00218	<4.00
BH03/11A	17/07/2015	0.588	<0.0001	27.4	0.000025	0.00312	<4.00
BH03/11A	08/10/2015	<0.30	<0.0001	29.4	<0.00002	0.00198	<4.00
BH03/11A	05/01/2016	<0.30	<0.0001	28.8	<0.00002	0.00276	<4.00
BH03/11A	22/04/2016	<0.30	<0.0001	28.3	0.000424	0.00138	<4.00
BH03/11A	25/07/2016	<0.30	<0.00008	29.1	<0.0001	0.00068	<4.00
BH03/11A	27/10/2016	<0.20	<0.00008	27.9	<0.0001	0.000553	<4.00
BH03/11A	26/01/2017	<0.30	<0.00008	28.1	0.000114	0.00106	<4.00
BH03/11A	03/05/2017	<0.30	<0.00008	29.5	0.00393	0.00324	<4.00
BH03/11A	17/07/2017	<0.30	<0.00008	28.8	<0.0002	0.000493	<4.00
BH03/11A	26/10/2017	<0.30	<0.00008	27.5	<0.0002	0.00322	<4.00
BH03/11A	31/01/2018	<0.30	<0.00008	30.7	<0.0002	0.00185	<4.00
BH03/11A	19/04/2018	<0.30	<0.00008	30.3	<0.0002	0.00252	<4.00
BH03/11A	12/07/2018	<0.30	<0.00008	28.6	<0.0002	<0.0004	<4.00
BH03/11A	04/10/2018	<0.30	<0.00008	28	<0.0002	<0.0004	<4.00
BH03/11A	30/01/2019	<0.30	<0.00008	29.1	<0.0002	0.00205	<4.00
BH03/11A	22/02/2019	0.836	<0.00008	29.7	<0.0002	0.000543	<4.00
BH03/11A	01/05/2019	<0.30	<0.00008	32.3	<0.0002	0.0021	<4.00
BH03/11A	01/08/2019	<0.1	<0.00004	29	0.00019	0.0024	<1.00
BH03/11A	06/11/2019	0.9	<0.00008	32	<0.00001	0.0014	<1.00
BH03/11A	05/02/2020	<0.30	<0.00008	29.1	<0.0002	0.00053	<4.00
BH03/11A	01/05/2020	<0.30	<0.00008	27.6	<0.0002	0.000635	<4.00
BH03/11A	01/07/2020	<0.30	<0.00008	31.5	<0.0002	<0.0004	<4.00
BH03/11A	19/11/2020	<0.30	<0.00008	33.4	<0.0002	<0.0004	<4.00
BH03/11A	27/01/2021	<0.30	<0.00008	34.7	<0.0002	0.000843	<4.00
BH03/11A	13/04/2021	<0.30	<0.00008	37.3	<0.0002	0.00132	<4.00
BH03/11A	28/07/2021	<0.30	<0.00008	38.8	<0.0002	<0.0004	<1.00
BH03/11A	20/10/2021	0.3	<0.001	37.9	<0.001	<0.005	<1.00
BH03/11A	27/01/2022	0.1	<0.001	37.2	<0.001	<0.005	<1.00
BH03/11A	04/05/2022	<0.30		37.9			<1.00
BH03/11A	21/07/2022	<0.30	<0.00008	36.6	<0.0002	0.000585	<1.00
BH03/11A	20/10/2022	<0.1	<0.0005	35.1	<0.0005	0.0008	<1.00
BH03/11A	11/01/2023	0.1	<0.001	41.7	<0.001	<0.005	<1.00
BH03/11A	24/04/2023	<0.1	<0.001	34.4	<0.001	<0.005	<1.00
BH03/11A	04/10/2023	0.3	<0.001	45.1	<0.001	<0.005	<1.00
BH03/11A	21/02/2024	0.6	<0.001	30.8	<0.001	<0.005	<1.00
BH03/11A	12/11/2024	0.050	<0.0001	37.7	<0.0006	0.00277	< 1.0

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH03/11B	22/04/2016	<0.30	<0.0001	8	0.000397	0.00368	<4.00
BH03/11B	26/01/2017	<0.30	<0.00008	7.9	0.000115	0.00103	<4.00
BH03/11B	03/05/2017	<0.30	<0.00008	9.4	<0.0001	0.00255	
BH03/11B	01/07/2020	<0.30	<0.00008	12.9	<0.0002	0.00612	<4.00
BH03/11B	19/11/2020	<0.30	<0.00008	26.3	<0.0002	0.0109	<4.00
BH03/11B	27/01/2021	<0.30	0.000094	33.7	0.00474	0.0117	<4.00
BH03/11B	13/04/2021	<0.30	<0.00008	118	<0.0002	0.00283	<4.00
BH03/11B	28/07/2021	<0.30	<0.00008	86.8	<0.0002	0.00329	<1.00
BH03/11B	20/10/2021	0.1	<0.001	69.8	<0.001	0.006	<1.00
BH03/11B	27/01/2022	0.3	<0.001	44.4	<0.001	<0.005	<1.00
BH03/11B	04/05/2022	<0.30		9.6			<1.00
BH03/11B	21/07/2022	<0.30	<0.00008	51.1	<0.0002	0.00802	<1.00
BH03/11B	20/10/2022	0.3	<0.0005	56.2	<0.0005	0.0061	<1.00
BH03/11B	11/01/2023	0.1	<0.001	50.8	<0.001	<0.005	<1.00
BH03/11B	24/04/2023	<0.1	<0.001	33.4	<0.001	<0.005	<1.00
BH03/11B	04/10/2023	0.3	<0.001	44.6	<0.001	<0.005	<1.00
BH03/11B	21/02/2024	<0.1	<0.001	26.5	<0.001	<0.005	<1.00
BH03/11B	12/11/2024	0.083	<0.0001	38.1	<0.0006	0.00215	< 1.0

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH01/19	22/02/2019	9.09	<0.00008	130	<0.0002	0.0171	<4.00
BH01/19	01/05/2019	7.11	<0.00008	191	<0.0002	0.0321	<4.00
BH01/19	01/08/2019	12.7	0.00005	107	0.00013	0.0017	<1.00
BH01/19	06/11/2019	324.1	0.00008	86	<0.00001	0.0085	<1.00
BH01/19	05/02/2020	14.5	<0.00008	100	<0.0002	0.0121	<4.00
BH01/19	01/05/2020	13.5	<0.00008	98.2	<0.0002	0.0122	<4.00
BH01/19	01/07/2020	13.8	<0.00008	104	<0.0002	0.0124	<4.00
BH01/19	19/11/2020	14	<0.00008	104	<0.0002	0.013	<4.00
BH01/19	27/01/2021	13	0.000187	98.1	<0.0002	0.0131	<4.00
BH01/19	13/04/2021	12.6	<0.00008	98.8	<0.0002	0.0129	<4.00
BH01/19	28/07/2021	13.4	<0.00008	127	0.000203	0.0168	<1.00
BH01/19	20/10/2021	13	<0.001	146	<0.001	0.021	<1.00
BH01/19	12/01/2022	13	<0.001	110	<0.001	0.02	<1.00
BH01/19	04/05/2022	11.5		115			<1.00
BH01/19	21/07/2022	11.3	<0.00008	114	<0.0002	0.0146	<1.00
BH01/19	20/10/2022	2.6	<0.0005	152	<0.0005	0.0167	<1.00
BH01/19	11/01/2023	0.6	<0.001	209	<0.001	0.02	<1.00
BH01/19	24/04/2023	<0.1	<0.001	195	<0.001	0.021	<1.00
BH01/19	04/10/2023	2.6	<0.001	205	<0.001	0.023	<1.00
BH01/19	23/02/2024	2.6	<0.001	289	<0.001	0.005	<1.00
BH01/19	12/11/2024	3.94	<0.0001	437	<0.0006	0.00984	< 1.0

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH03/19	22/02/2019	0.388	0.000565	23.4	0.0453	0.0297	<4.00
BH03/19	01/05/2019	0.364	<0.00008	30.2	<0.0002	0.0011	<4.00
BH03/19	06/11/2019	1.5	<0.00004	31	<0.00001	0.0012	<1.00
BH03/19	05/02/2020	<0.30	<0.00008	26.8	0.00054	0.00088	<4.00
BH03/19	01/07/2020	0.32	<0.00008	28.5	<0.0002	<0.0004	<4.00
BH03/19	19/11/2020	<0.30	<0.00008	26.8	<0.0002	<0.0004	<4.00
BH03/19	27/01/2021	<0.30	<0.00008	26.2	<0.0002	0.000463	<4.00
BH03/19	13/04/2021	<0.30	<0.00008	25.6	<0.0002	<0.0004	<4.00
BH03/19	28/07/2021	<0.30	<0.00008	37.9	<0.0002	0.00222	<1.00
BH03/19	20/10/2021	0.3	<0.001	26.1	<0.001	<0.005	<1.00
BH03/19	27/01/2022	0.1	<0.001	25.8	<0.001	<0.005	<1.00
BH03/19	04/05/2022	<0.30		30.9			<1.00
BH03/19	21/07/2022	<0.30	<0.00008	27.9	<0.0002	0.000598	<1.00
BH03/19	11/01/2023	0.1	<0.001	47.1	<0.001	<0.005	<1.00
BH03/19	25/04/2023	<0.1	<0.001	52.5	<0.001	<0.005	<1.00
BH03/19	05/10/2023	0.1	<0.001	44.8	<0.001	<0.005	<1.00
BH03/19	21/02/2024	0.6	<0.001	31.8	<0.001	<0.005	<1.00
BH03/19	12/11/2024	0.041	<0.0001	51.4	<0.0006	0.00196	< 1.0

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH02/19A	22/02/2019	<0.30	<0.00008	113	<0.0002	0.0194	<4.00
BH02/19A	01/05/2019	0.417	<0.00008	338	<0.0002	0.0248	<4.00
BH02/19A	01/08/2019	0.3	<0.00004	123	0.00002	0.0128	<1.00
BH02/19A	06/11/2019	1.2	<0.00008	68	<0.00001	0.0085	<1.00
BH02/19A	05/02/2020	<0.30	<0.00008	23.5	<0.0002	0.0271	<4.00
BH02/19A	01/05/2020	<0.30	<0.00008	72.7	<0.0002	0.00452	<4.00
BH02/19A	01/07/2020	<0.30	<0.00008	232	<0.0002	0.0378	<4.00
BH02/19A	19/11/2020	<0.30	<0.00008	77.2	<0.0002	0.00768	<4.00
BH02/19A	27/01/2021	<0.30	<0.00008	76.3	<0.0002	0.00737	<4.00
BH02/19A	13/04/2021	<0.30	<0.00008	344	<0.0002	0.0121	<4.00
BH02/19A	28/07/2021	<0.30	<0.00008	96.6	<0.0002	0.00799	<1.00
BH02/19A	20/10/2021	0.3	<0.001	92.5	<0.001	0.011	<1.00
BH02/19A	27/01/2022	0.3	<0.001	90.3	<0.001	0.009	<1.00
BH02/19A	04/05/2022	0.368		192			<1.00
BH02/19A	21/07/2022	<0.30	<0.00008	181	<0.0002	0.0309	<1.00
BH02/19A	20/10/2022	0.6	<0.0005	169	<0.0005	0.0313	<1.00
BH02/19A	11/01/2023	0.1	<0.001	188	<0.001	0.027	<1.00
BH02/19A	26/04/2023	<0.1	<0.001	207	<0.001	0.013	<1.00
BH02/19A	04/10/2023	0.3	<0.001	191	<0.001	0.016	<1.00
BH02/19A	21/02/2024	0.3	<0.001	50.9	<0.001	0.006	<1.00
BH02/19A	12/11/2024	0.111	<0.0001	149	<0.0006	0.01100	< 1.0

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH05/15	22/02/2019	<0.30	<0.00008	15.9	<0.0002	0.000768	<4.00
BH05/15	01/05/2019	<0.30	0.000264	17.7	<0.0002	0.00176	<4.00
BH05/15	01/08/2019	0.1	<0.00004	19	0.00005	0.0039	<1.00
BH05/15	06/11/2019	0.8	<0.00008	71	<0.00001	0.0031	<1.00
BH05/15	05/02/2020	<0.30	<0.00008	18.9	<0.0002	0.00271	<4.00
BH05/15	01/07/2020	<0.30	<0.00008	17.8	0.000276	0.00199	<4.00
BH05/15	13/04/2021	0.809	<0.00008	15.7	<0.0002	0.00839	<4.00
BH05/15	28/07/2021	0.454	<0.00008	14.2	0.000521	0.00394	<1.00
BH05/15	20/10/2021	0.3	<0.001	14.8	<0.001	<0.005	<1.00
BH05/15	27/01/2022	0.3	<0.001	19.7	<0.001	<0.005	<1.00
BH05/15	04/05/2022	<0.30		14.3			<1.00
BH05/15	27/07/2022	<0.30	0.000162	17.4	0.0411	0.0291	<1.00
BH05/15	20/10/2022	0.1	<0.0005	16	<0.0005	0.0032	<1.00
BH05/15	11/01/2023	0.1	<0.001	15.8	<0.001	<0.005	<1.00
BH05/15	24/04/2023	<0.1	<0.001	15.8	<0.001	<0.005	<1.00
BH05/15	25/10/2023	0.1	<0.001	14.8	<0.001	<0.005	<1.00
BH05/15	23/02/2024	0.5	<0.001	14.2	<0.001	<0.005	<1.00
BH05/15	12/11/2024	0.075	<0.0001	18.6	<0.0006	0.00122	< 1.0

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH01/21	05/11/2021	0.1	<0.001	35.7	<0.001	0.005	<1.00
BH01/21	18/11/2021	0.3	<0.001	50.5	<0.001	0.006	<1.00
BH01/21	01/12/2021	0.1	<0.001	49.3	<0.001	<0.005	<1.00
BH01/21	12/01/2022	0.3	<0.001	85.2	<0.001	<0.005	<1.00
BH01/21	24/02/2022	0.1	<0.001	83.5	<0.001	<0.005	<1.00
BH01/21	31/03/2022	0.3	<0.001	58.7	<0.001	<0.005	<1.00
BH01/21	11/05/2022	0.6	<0.001	39.4	<0.001	<0.005	<1.00
BH01/21	21/06/2022	0.1	<0.001	66	<0.001	0.008	<1.00
BH01/21	18/08/2022	0.1	<0.001	42.8	<0.001	<0.005	<1.00
BH01/21	20/09/2022	0.1	<0.001	49.9	<0.001	<0.005	<1.00
BH01/21	20/10/2022	0.3	<0.0005	48.1	<0.0005	0.0021	<1.00
BH01/21	09/11/2022	0.1	<0.001	46.9	<0.001	<0.005	<1.00
BH01/21	09/12/2022	<0.1	<0.001	50.9	<0.001	<0.005	<1.00
BH01/21	11/01/2023	0.1	<0.001	49.5	<0.001	<0.005	<1.00
BH01/21	09/02/2023	0.1	<0.001	48.8	<0.001	<0.005	<1.00
BH01/21	09/03/2023	0.1	<0.001	69.6	<0.001	<0.005	<1.00
BH01/21	24/04/2023	<0.1	<0.001	45.7	<0.001	<0.005	<1.00

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH02/21	05/11/2021	0.1	<0.001	35.9	<0.001	<0.005	<1.00
BH02/21	18/11/2021	0.3	<0.001	39.3	<0.001	<0.005	<1.00
BH02/21	01/12/2021	0.5	<0.001	33.9	<0.001	<0.005	<1.00
BH02/21	27/01/2022	0.3	<0.001	34.7	<0.001	<0.005	<1.00
BH02/21	24/02/2022	0.1	<0.001	33	<0.001	<0.005	<1.00
BH02/21	31/03/2022	0.3	<0.001	38	<0.001	<0.005	<1.00
BH02/21	11/05/2022	0.6	<0.001	36.7	<0.001	<0.005	<1.00
BH02/21	21/06/2022	0.1	<0.001	41	<0.001	<0.005	<1.00
BH02/21	18/08/2022	0.1	<0.001	44.4	<0.001	<0.005	<1.00
BH02/21	20/09/2022	0.1	<0.001	45	<0.001	<0.005	<1.00
BH02/21	20/10/2022	0.3	<0.0005	42.3	<0.0005	0.0018	<1.00
BH02/21	09/11/2022	0.1	<0.001	43.8	<0.001	<0.005	<1.00
BH02/21	09/12/2022	<0.1	<0.001	41.8	<0.001	<0.005	<1.00
BH02/21	11/01/2023	0.1	<0.001	34.4	<0.001	<0.005	<1.00
BH02/21	09/02/2023	<0.1	<0.001	38.5	<0.001	<0.005	<1.00
BH02/21	09/03/2023	0.1	<0.001	38.8	<0.001	<0.005	<1.00
BH02/21	24/04/2023	<0.1	<0.001	39.3	<0.001	<0.005	<1.00
BH02/21	18/05/2023	0.1	<0.001	45.7	<0.001	<0.005	<1.00
BH02/21	30/06/2023	0.1	<0.001	45.6	<0.001	<0.005	2.43
BH02/21	28/09/2023	0.3	<0.001	54	<0.001	<0.005	<1.00
BH02/21	25/10/2023	0.1	<0.001	45.7	<0.001	<0.005	<1.00
BH02/21	14/11/2023	0.3	<0.001	51.5	<0.001	<0.005	<1.00
BH02/21	12/12/2023	0.1	<0.001	37.1	<0.001	<0.005	<1.00
BH02/21	21/02/2024	0.3	<0.001	35.7	<0.001	<0.005	<1.00
BH02/21	12/11/2024	0.056	<0.0001	49.4	<0.0006	0.00205	< 1.0

Monitoring Point	Date Sampled	Ammoniacal Nitrogen as N mg/l	Cadmium , Total as Cd mg/l	Chloride as Cl mg/l	Lead , Total as Pb mg/l	Nickel , Total as Ni mg/l	Toluene µg/l
BH03/21	18/11/2021	0.6	<0.001	42.3	<0.001	<0.005	<1.00
BH03/21	01/12/2021	<0.1	<0.001	43.6	<0.001	<0.005	<1.00
BH03/21	27/01/2022	0.3	<0.001	47	<0.001	<0.005	<1.00
BH03/21	24/02/2022	0.1	<0.001	43.5	<0.001	<0.005	<1.00
BH03/21	31/03/2022	0.1	<0.001	43.9	<0.001	<0.005	<1.00
BH03/21	11/05/2022	0.6	<0.001	39.2	<0.001	<0.005	<1.00
BH03/21	21/06/2022	0.1	<0.001	42.7	0.001	<0.005	<1.00
BH03/21	18/08/2022	0.1	<0.001	43.9	<0.001	<0.005	<1.00
BH03/21	20/09/2022	0.1	<0.001	43.7	<0.001	<0.005	<1.00
BH03/21	20/10/2022	0.3	<0.0005	39.9	<0.0005	0.0023	<1.00
BH03/21	09/11/2022	0.1	<0.001	93.8	<0.001	0.007	<1.00
BH03/21	09/02/2023	<0.1	<0.001	34	<0.001	<0.005	<1.00
BH03/21	09/03/2023	0.1	<0.001	73.4	<0.001	0.009	<1.00
BH03/21	25/04/2023	<0.1	<0.001	33.8	<0.001	<0.005	<1.00
BH03/21	18/05/2023	0.1	<0.001	30.6	<0.001	<0.005	<1.00
BH03/21	30/06/2023	0.1	<0.001	49.8	<0.001	0.007	<1.00
BH03/21	28/09/2023	0.3	<0.001	58.7	<0.001	0.007	<1.00
BH03/21	25/10/2023	0.1	<0.001	38.2	<0.001	0.015	<1.00
BH03/21	14/11/2023	0.4	<0.001	41.2	<0.001	0.005	<1.00
BH03/21	12/12/2023	0.3	<0.001	59.7	<0.001	0.007	<1.00
BH03/21	12/11/2024	0.099	<0.0001	24.4	<0.0006	0.00294	< 1.0

APPENDIX 3810/HRA/A4

EA Note: Suggested leachate quality for rogue loads

‘Advice on potential source term monitoring for inert landfills in relation to Rogue Loads.

Collated in 2023 in relation to review of limited monitoring available of leachate in inert soils type landfills.

While the starting point for any inert site is that the residual leachate quality would be that of the inert WAC criteria permitted, a consistent approach to rogue load modelling (to assess risk of accidents) is also expected to enable risk assessment of the more soluble and mobile contaminants that could arise from the deposition of more variable soils wastes.

Any quantitative modelling of these sites should consider the fate of a possible range of contaminants within the source term. This should be determined by undertaking a risk screen against appropriate water quality standards or natural baseline quality.

From Environment Agency observation of the fate of soils leachates, the three most mobile contaminants that could leach from deposited soils are: sulphate, ammoniacal nitrogen and nickel (all non-hazardous substances). While likely to be present only at trace concentrations in leachate, selection of one of either arsenic or lead should be used to assess the fate of a nominal hazardous substance in leachate at each site.

From our observations from a limited data set of sites, the following ranges of leachate quality are considered appropriate to represent concentrations likely from the outcome of accidental rogue load acceptance:

Possible Range of Leachate Quality for assessing accidental rogue load acceptance

	Minimum	*Most Likely*	*Maximum*
Arsenic	0.001	0.007	0.06
Lead	0.002	0.007	0.15
Ammoniacal Nitrogen	0.3	8	25
Chloride	100	300	800
Sulphate	200	1200	1800
Nickel	0.002	0.02	0.12

Units: mg/l

We note that the above advice is developing / emerging work for both industry and the Agency and is limited to date by current guidance stating that leachate quality monitoring is not required at inert landfills. Should the operator wish to install or undertake any programme of leachate monitoring (particularly at the higher risk sites on Principal aquifers over short or longer term timescales), the Environment Agency would be likely to support such an initiative.