KINGS POND

ALTON, HAMPSHIRE

WEIR REMOVAL FEASIBILITY STUDY

ALTON TOWN COUNCIL

DOCUMENT REFERENCE:

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WATER | ENVIRONMENT

Water Environment Limited
6 Coppergate Mews
103 Brighton Road
Surbiton
London
KT6 5NE

Tel: 020 8545 9720

www.WaterEnvironment.co.uk

Authorisation and Version Control

Water Environment was commissioned by Alton Town Council to consider options for removal of the weir at the downstream end of Kings Pond, with a view to reprofiling the river to reduce siltation and improve ecological habitat. The following document explores available opportunities and constraints for the presented options at Kings Pond, Alton.

Author:	**Gareth Snyman** MSc Geomoroph, BSc EWM	
Checker:	**Laura Sleightholme** MSc DIC, BSc (Hons) Geol MCIWEM FGS	
Approver:	**Guy Laister** Director	

for and on behalf of Water Environment Limited

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ABBREVIATIONS

Acronym	Definition
AOD	Above Ordnance Datum
ATC	Alton Town Council
BGL	Below Ground Level
BGS	British Geological Survey
DEFRA	Department for Environment Food and Rural Affairs
DTM	Digital Terrain Model
EA	Environment Agency
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
HMWB	Heavily Modified Water Body
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NPPF	National Planning Policy Framework
NRA	National Rivers Authority
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RBMP	River Basin Management Plan
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
WFD	Water Framework Directive

1 INTRODUCTION

General Information

1.1 The Kings Pond is an online waterbody, located in Alton, Hampshire. It was created by constructing a dam across the River Wey in the late 18th Century. Alton Town Council wish to consider options for future improvements to the pond to improve biodiversity and reduce maintenance burdens.

Scope of Study

1.2 In order to progress their aims to improve upon the existing status of the Kings Pond and downstream River Wey, Alton Town Council (ATC) have commissioned Water Environment Ltd to undertake a feasibility study. This study aims to:

- Review all publicly available data, including but not limited to; local flood maps, hydraulic model information, flow and level gauges, catchment water quality data and asset plans.
- Review the topographic survey information and hydrological survey of the pond, including depth and silt thicknesses, using this data to create a 3D model of the existing pond.
- Undertake a site visit with pond and watercourse walkover to provide a complete overview of the local area and interaction with waterbodies, review physical structures and drainage assets to verify survey data.
- Understand local concerns through review of previously available data and discussions with ATC and the Environment Agency (EA) who are already involved in the project.
- Outline potential improvement options for the pond, including feasibility of removing the existing weir with a view to improving overall in-channel health.
- Production of overview sketches, for presentation within this report to ATC, and a technical long-section to confirm the expected profile of the watercourse if the weir has been removed.
- Consideration of the benefits and risks associated with each option, considering flood risk implications and the impacts on local ecology in both short and long-term. This will also consider the potential costs associated with each option, as well as scoping of further technical assessments.
- Finally, production of a feasibility report for presentation to and on-going discussion with ATC.

Previous Work

1.3 It is understood that the siltation issue at Kings Pond has been a long-term concern, and therefore previous remediation work and a number of previous surveys and studies have been undertaken to date.

Weir and Sluice

1.4 The outlet weir was built in 1991 by National Rivers Authority (NRA). The weir has an associated sluice, which is kept permanently closed, but could be used to drain the pond if required. The culvert and sluice arrangement remains as it was built, with no further modifications known.

Dredging

1.5 In 1994, NRA surveyed the pond and found that depths were up to 2.0 m meters at the northern end, reducing to 0.5m to 0.7m at the southern end. Following surveying, a working party was formed, led by the Town Clerk. An outside organisation (Dredging Research Limited Of Godalming – no longer active) were appointed to advise, and Land & Water were subsequently appointed as the contractor.

1.6 Land & Water's contract was for removal of 9,400m^3 of silt from the pond, which was deposited on islands, on the land below Ashdell Road, and to create revetments around islands and the banks of the pond. The aim was to increase to dredge to depths of 1.75m at the northern end, 1.25m in the central section and 1.0m either side of the island at the southern end. This work was carried out in late 1996. Final topsoiling was completed until late 1997, once the bunds had dried out.

1.7 Further remedial work to the revetments was carried out in 2005, but no further dredging has taken place since.

Contamination

1.8 In April 1995, five samples were taken from the pond and sent for analysis, in addition samples were taken from soils in proposed spreading areas. The results were considered to be moderate to satisfactory for nutrient and organic matter. Levels of toxic metals were low except for high levels of lead and zinc, indicating some previous contamination. The level of lead was acceptable for use for recreational areas but not agricultural, however the level of zinc required mixing with other soil.

Management Plan

1.9 A Draft Management Plan was completed by Aquamaintain Ltd[1] in May 2022 to review the current status of the pond and River Wey. This reports that the pond dramatically affects the character of the River Wey in this location, with particular concern for; slowing of flow, heavy siltation and barriers to fish passage.

1.10 As the river enters the pond, water is slowed, and silt deposited. Water is also warmed in the pond during the summer months. This report also states that the *"presence of large numbers of waterfowl and introduced benthic feeding fish result in increased nutrient levels, greater turbidity and a reduction of aquatic macrophytes and invertebrates"*.

1.11 This warmed and nutrient rich water then exits the pond and flows back into the River Wey. This all has a resulting impact on the current status of the waterbody under the Water Framework Directive (WFD).

1.12 The Aquamaintain Draft Management Plan makes a series of suggestions and recommendations for improvement of the pond, including; a long-term option to investigate taking the pond offline and reprofiling of the river, and shorter-term options such as mechanically removing silt and redirection of surface water drains.

[1] Aquamaintain, Kings Pond, Alton – Draft Management Plan, May 2022

2 SITE DESCRIPTION

Location

2.1 The site is located in Alton, Hampshire, GU34 2TB, north of the A31. The King's Pond site is located to the south of Alton Station and residential properties located off Paper Mill Lane on Waterside Court. The southern and eastern boundary of the site is bounded by Ashdell Road, and the western edge by the railway line.

2.2 A small car parking area and an area of greenspace is present on the southern side of the pond, located off Ashdell Road.

2.3 The site location is shown in Figure 1.

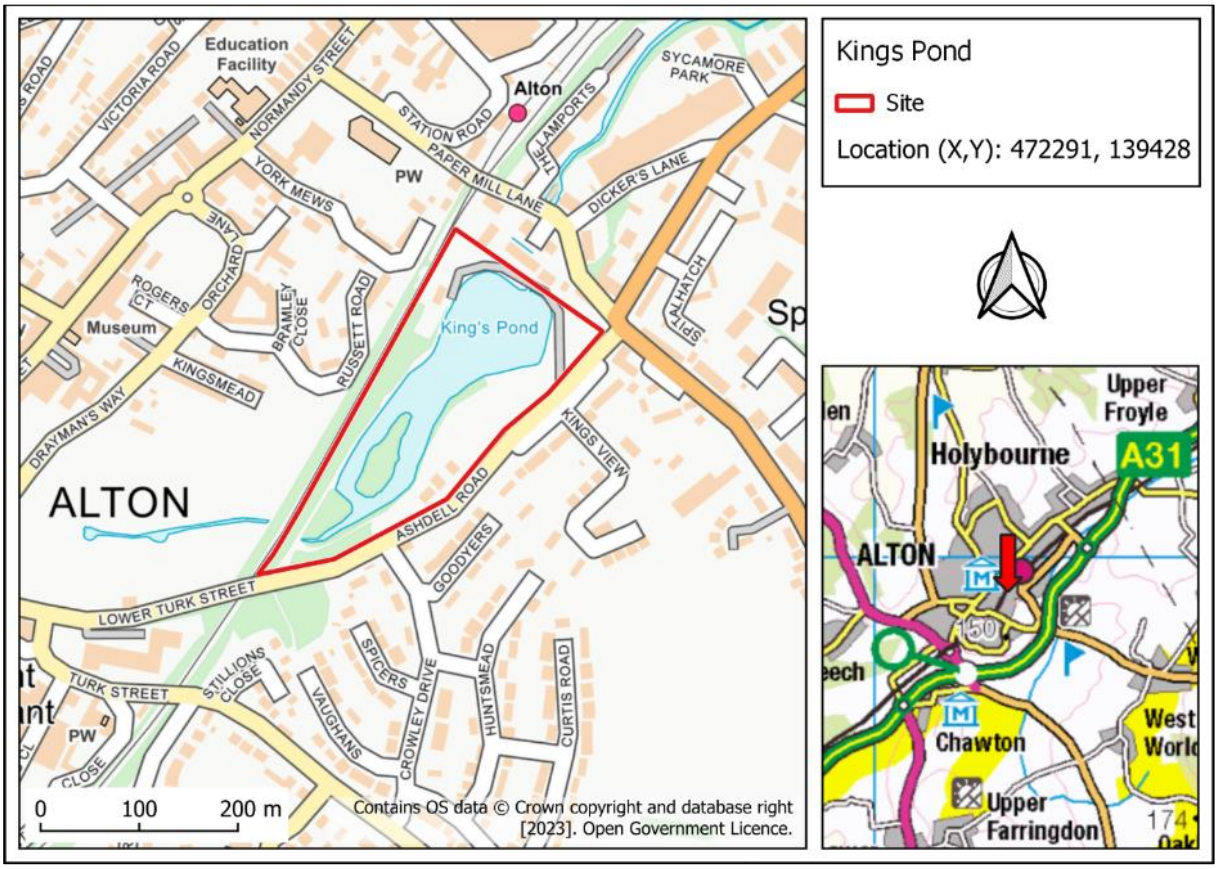


Figure 1 - Site Location

Existing Watercourses

2.4 The Kings Pond is an online waterbody. It was created by constructing a dam across the River Wey in the late 18th Century to serve a paper mill, which was redeveloped in 1989 to create the Waterside Court flats. The weir structure is still present, spanning the north-eastern end of the pond.

2.5 The River Wey is a chalk stream which rises at Will Hall Meadow, approximately 1.5km upstream of Kings Pond. Chalk streams are groundwater fed and are of great ecological importance due to their excellent water quality and typical gravel bed providing habitat for a diverse range of flora and fauna.

2.6 The River Wey flows through the urban area of Alton via another small online pond close to Tanhouse Lane west of the town centre, before passing under the railway line to enter Kings Pond. Upstream of the pond, the river is in a mixture of open channel and culvert with efforts being made locally to deculvert and improve in-channel habitat where possible.

2.7 At the downstream end of the pond, water flows over the existing weir, before entering twin 450mm diameter pipes followed by twin 675mm diameter pipes, which emerge as open channel in front of properties at Waterside Court (Blocks 15-32). Here the channel splits into two parallel culverts, which then open as features in front of Block 55-60 and Block 1-6 respectively. These channels rejoin, flowing in culvert under Paper Mill Lane before emerging as an open waterbody which flows on the west (left) side of a property on the northern side of Paper Mill Lane (no. 10) with a backwater channel seen on the east (right) side.

2.8 The River Wey then flows in a north-easterly direction between industrial properties on Newman Lane and Mill Lane. After passing under Mill Lane, the watercourse joins the Caker Stream, before progressing north.

Topographic Survey

2.9 A topographic survey of the site was completed in November 2023. This includes detailed survey of the pond, inlet and outlet structures, the islands, and the area of open space on the southern side close to the car park. This survey was completed in three-dimensions, to OSTN15 (GB) and OSGM15 (GB).

2.10 Typically, bed levels within the pond range from 98.9m at the southern end, 97.9m around the island, 97.0m within the central portion and 97.5m at the northern end. Levels are 99.6m and 99.3m on the large and small islands respectively. Ground levels on the banks rise away from the water's edge.

2.11 The depth of the pond was measured to both hard bed level and to the top of silt level, and a number of cross-sections of the pond were produced. Silt thicknesses at the upstream end, around the island, range from 0.6m to 1.0m. Across the centre of the pond, these range from 0.7m to 1.1m and at the downstream end from 0.8m to 1.2m approximately. As such, it can be seen that all areas of the pond experience silt thicknesses in excess of 1m.

2.12 A copy of the topographic survey is provided in Appendix B.

Site Walkover

2.13 A site walkover survey and meeting onsite with ATC, the EA and WEL was undertaken on 22nd November 2023. This included a full walkover of the area surrounding Waterside Court downstream of the outlet structure and inspection of the outfall structure and grills. The walkover subsequently progressed upstream of the pond, through the urban area which includes current construction sites where work is being carried out to deculvert the River Wey. Finally, an inspection of the upstream inlet structure, outfalls from local drainage and the pond itself.

Key Structures

2.14 The Kings Pond is located between two key structures; the inlet structure at the south-western end of the pond immediately downstream of the railway line, and the outlet structure at the north-eastern end.

2.15 The inlet structure includes a culvert which carries the River Wey beneath the railway line within an arch culvert (springing height 99.64m and arch level of 100.17m) The pond bed level immediately downstream of this culvert is 98.98m to 99.00m, as shown in Figure 2. Two smaller outfalls enter the pond through the headwall. A photograph of the headwall is included in Figure 4.

Figure 2 – Inlet Structure

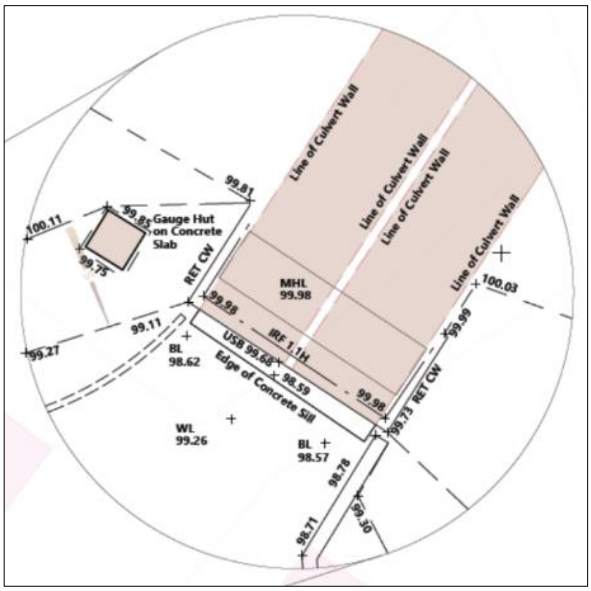


Figure 3 – Outlet Structure

Figure 4 – Photograph of Inlet

Figure 5 – Photograph of Outlet Grill

2.16 The outlet structure is more complex, with only a limited amount visible and available for surveying. The pond bed level in this location is between 98.57m and 98.62m. The underside of the concrete bridge structure is marked as 99.68m, with manhole level at 99.98m. This can be seen in Figure 3.

2.17 As can be seen from the site visit photograph in Figure 5, the weir / sluice is located within a chamber which has a debris screen across the front. This serves to catch vegetation, preventing this from entering the culverts downstream. The grill spacing was measured on site to be 50mm centres.

2.18 Since the internal chamber of the outfall structure were not accessed for the topographic survey, the original 1991 sluice and weir construction drawings have been reviewed. An excerpt of this is shown in Figure 6. This illustrates the arrangement of the thin plate weir (left side, looking downstream from the pond) and the sluice gate (right side).

2.19 The bed level within the chamber is shown as 98.62m AOD, which corroborates well with the recent survey within the pond immediately upstream of the chamber entrances. The soffit level above both structures is 99.75m.

2.20 The sluice gate level is at 99.60m when fully closed. It is understood that this is always closed at present. The thin plate weir is set at 99.35m.

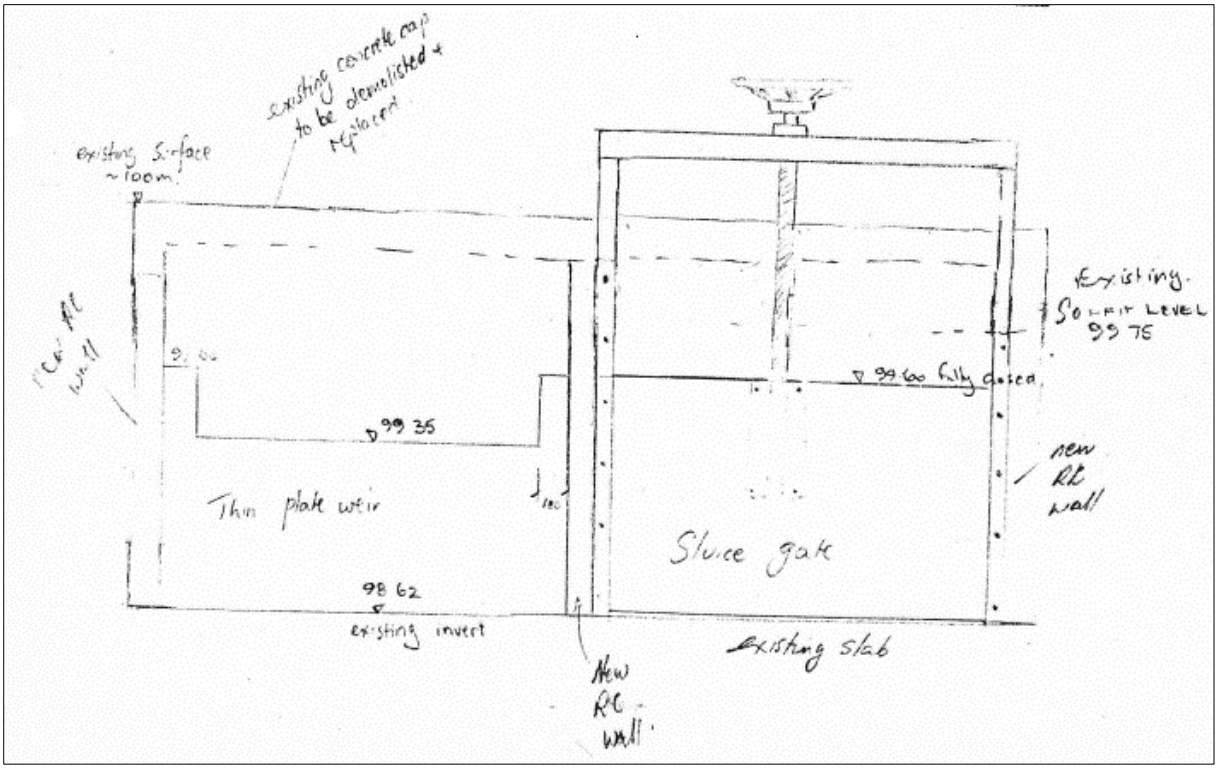


Figure 6 – Sluice and Weir Construction Drawings

3 BASELINE DATA

Flood Risk and Hydrology

Environment Agency Flood Zone Maps

3.1 The pond itself is located in Flood Zone 3 based on the GOV.UK Flood Map for Planning, with small areas of flooding also shown immediately downstream within Waterside Court and on Paper Mill Lane. This is shown in Figure 7.

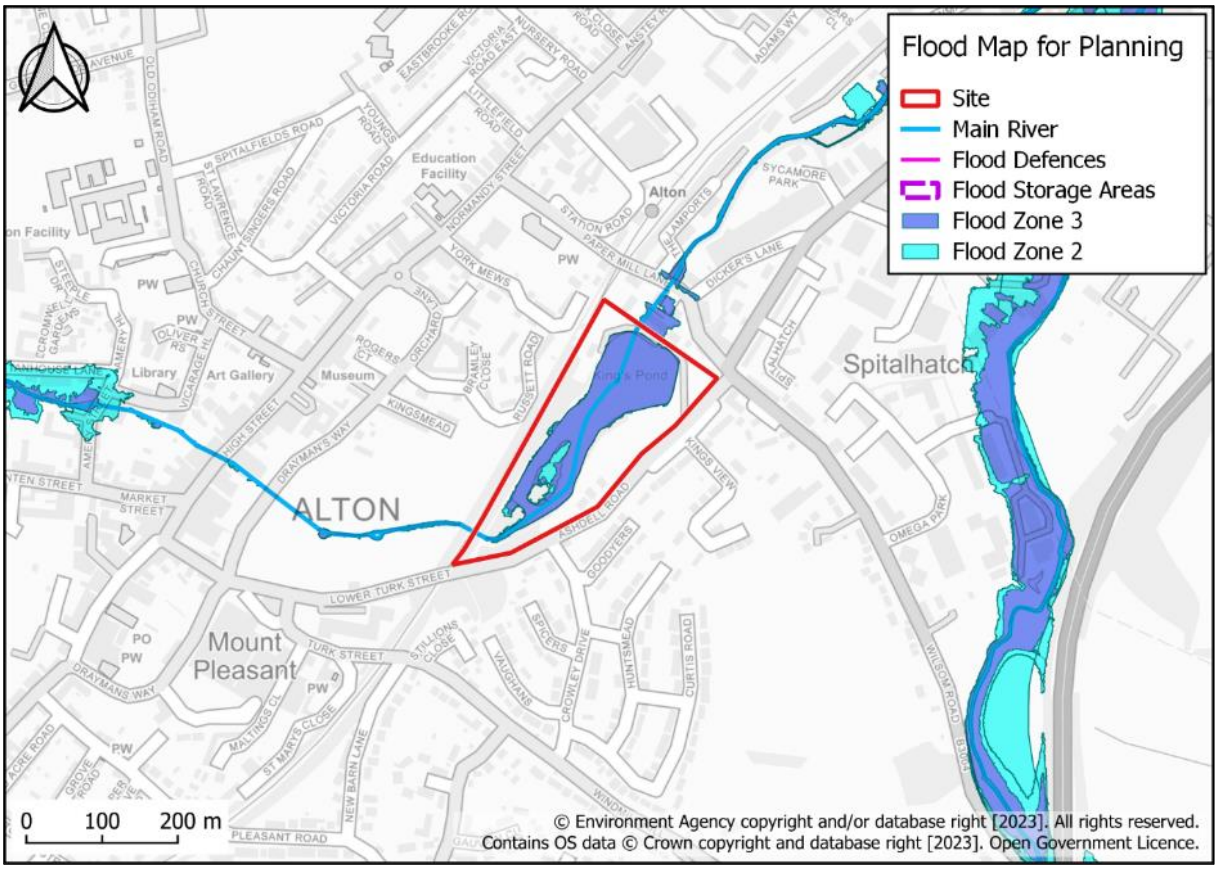


Figure 7 – GOV.UK Flood Map for Planning

3.2 According to the flood map, significant flood events could impact upon the residential properties in Waterside Court, and this has the potential to increase in future due to climate change. However, these have been designed to be raised significantly above surrounding ground levels and it is therefore assumed that these were built with due consideration for the local risk of flooding. The property at No. 10 Paper Mill Lane, assumed to be a workshop, is located on an island within the River Wey which is at risk of flooding.

3.3 This pond is not shown to have flooded in any of the EA's major recorded flood events, including 6th March 1947, which caused significant flooding of nearby watercourses.

3.4 The flood zone map for the pond itself is not of particular concern since there are no vulnerable receptors within the red line boundary. However, any physical changes to the pond including alterations to the sluice / weir or any bed or bank reprofiling, may have resulting impacts on areas downstream. It is critical that a robust assessment of flood risk is part of any further work once preferred options have been chosen and ensure that there is no potential for increases elsewhere at any return period event.

Hydraulic Model

3.5 To further the investigation of flood risk, the EA were contacted at the earliest stage in order to request a copy of their hydraulic model of the River Wey in this location. They were able to provide a full, working copy of the model and all associated modelling reports and data.

3.6 The site is covered by the "Wey Middle (Tilford to Jacob Well) 2020" model. This is one of a number of hydraulic models which cover the River Wey catchment from the source (close to Alton) to the downstream extent where it reaches the River Thames to the south-west of London.

3.7 The hydraulic model is one-dimensional (1D) only, and was constructed in Flood Modeller Pro, a popular and commonly used modelling package. Cross-sections of the watercourse are presented in a standard way, typical of this type of watercourse. Whilst it is more common to produce linked 1D-2D models nowadays, this accuracy of a 1D only model is typically robust for river sections.

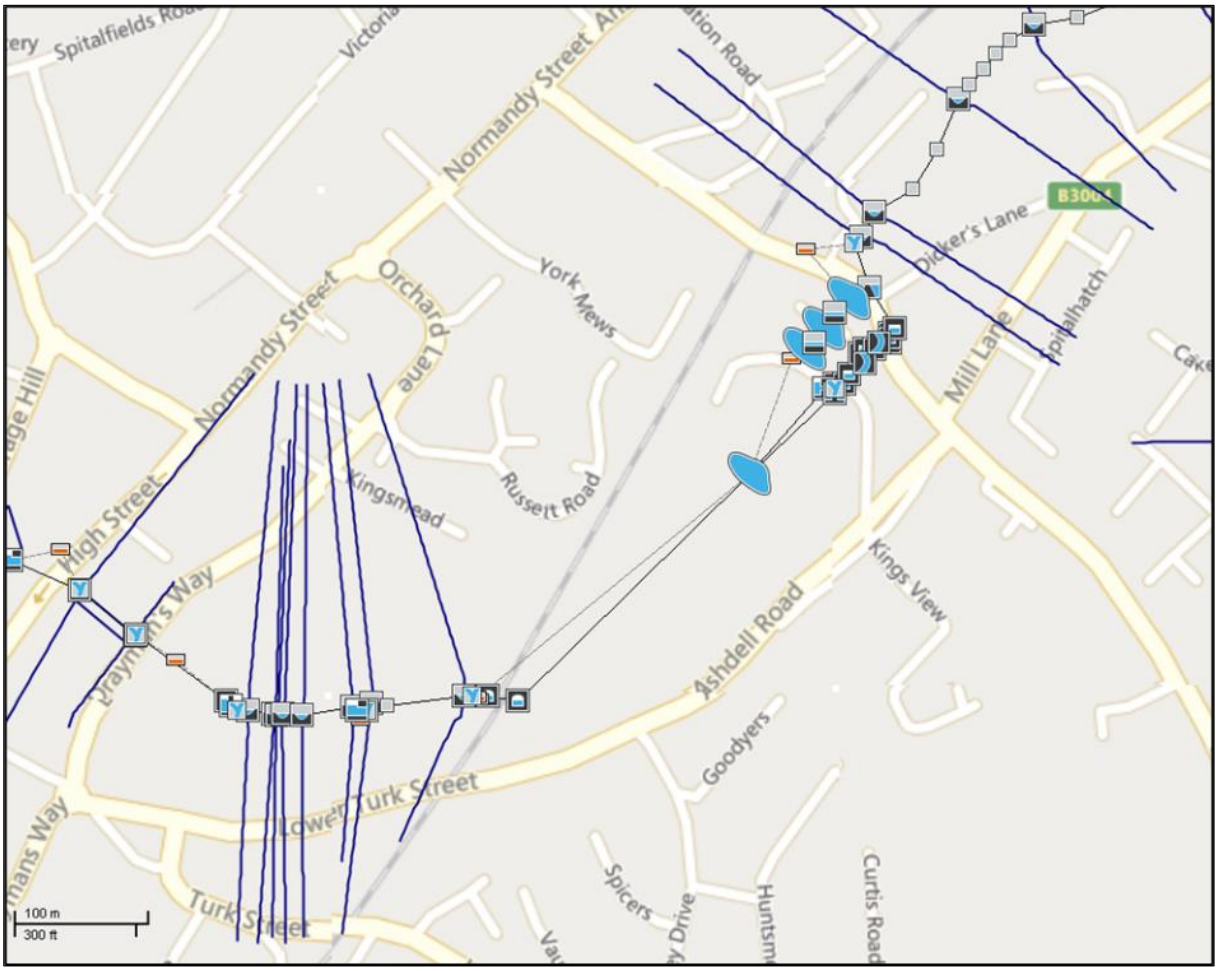


Figure 8 – Schematic of 1D Wey Middle Hydraulic Model

3.8 The pond is presented as a reservoir unit. From review of the hydraulic model, it appears that the storage area definition is poorly defined. The model has a wetted plan area of 20,390m^2 at elevation of 98.53m AOD. Interrogation of the provided survey presents a wetted area of 16,600m^2 at the same elevation. This indicates that the model is potentially over estimating the wetted area compared to reality.

3.9 This is not uncommon since EA models are broad-scale and budget constraints mean that not everywhere can be surveyed in detail. However, since ATC are now in possess of a significantly

more detailed topographic survey, refinements and improvements to the hydraulic model would be possible to better represent reality.

3.10 The pond outlet is modelled as two separate offices, with a culverted connection to the River Wey downstream of Paper Mill Lane. In reality, sections of this are in open channel through Waterside Court. The overland flow downstream of the pond is modelled as a series of 1D floodplain sections connecting small reservoir units.

3.11 This area of the model would benefit from representation with a linked 1D-2D model to better depict flow paths and areas of flood risk. It is recommended that a local update to the baseline hydraulic model is considered prior to allow proposed options to be tested with greater accuracy.

Surface Water Runoff

3.12 The GOV.UK Risk of Surface Water Flooding maps show the likely extent of flooding for a range of events. Surface water flood maps are a good indicator of natural overland flow routes in the local area, as shown in Figure 9.

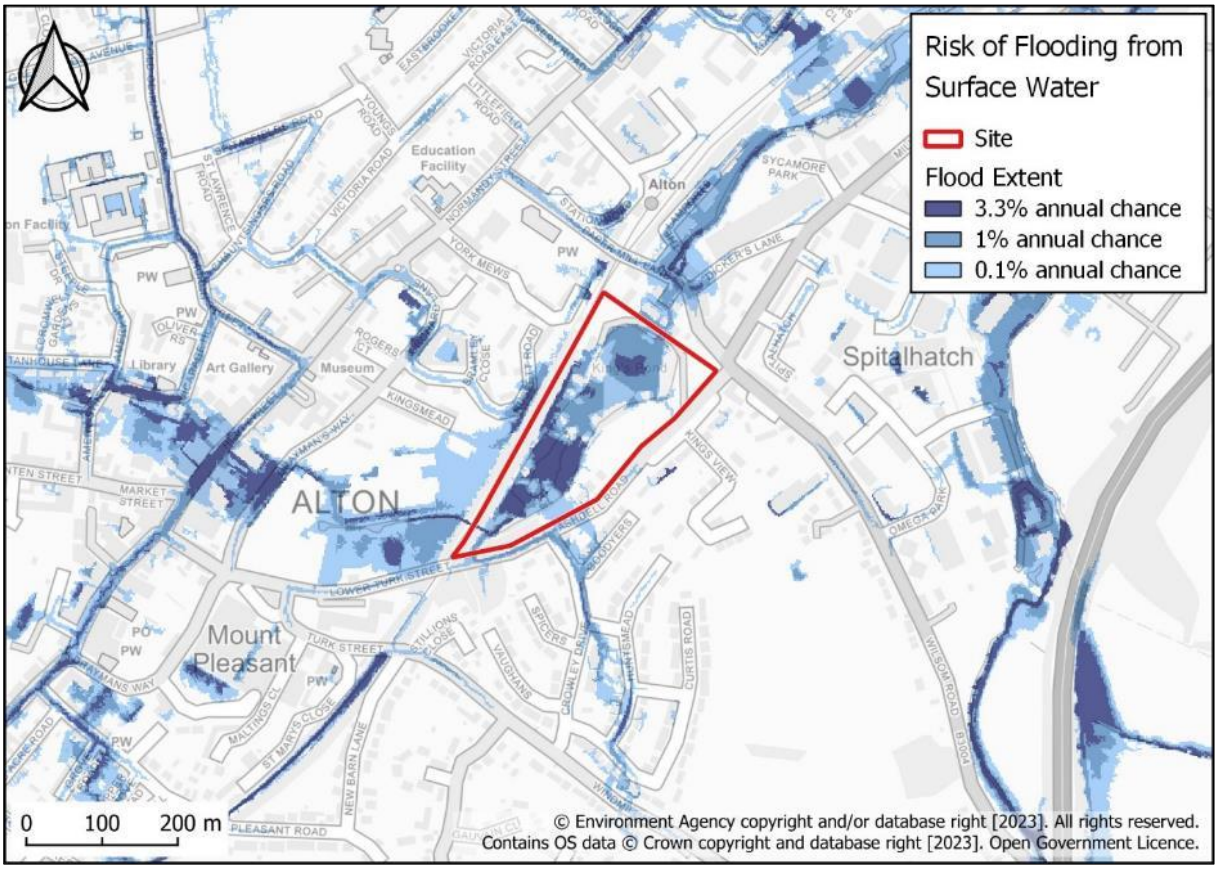


Figure 9 – GOV.UK Risk of Surface Water Flooding Map

3.13 Surface water flooding around the pond and immediately downstream is similar to the Flood Zone maps, with increased areas of risk on the western side of the pond. Runoff routes are also clearly shown from the residential area to the south (Crowley Drive) which flows over Ashdell Road and into the pond.

3.14 Upstream of the pond areas of surface water flooding are extensive in the local area, typically following the river corridor with areas of ponding on the upstream side of the railway line. Downstream of the pond, more significant flooding is shown around The Lamports, Paper Mill Lane and Dicker's Lane.

3.15 The surface water flood mapping appears to show properties at Waterside Court outside of the area of flooding, indicating that these are properly represented within the model. It is likely that this representation is more accurate that the output produced by the fluvial Flood Zone maps.

Catchment Hydrology and Flow Data

3.16 The hydrological catchment of the River Wey (North Wey at Alton) is 54.3km^2, which drains an area to the north and west of Alton, as shown in Figure 10.

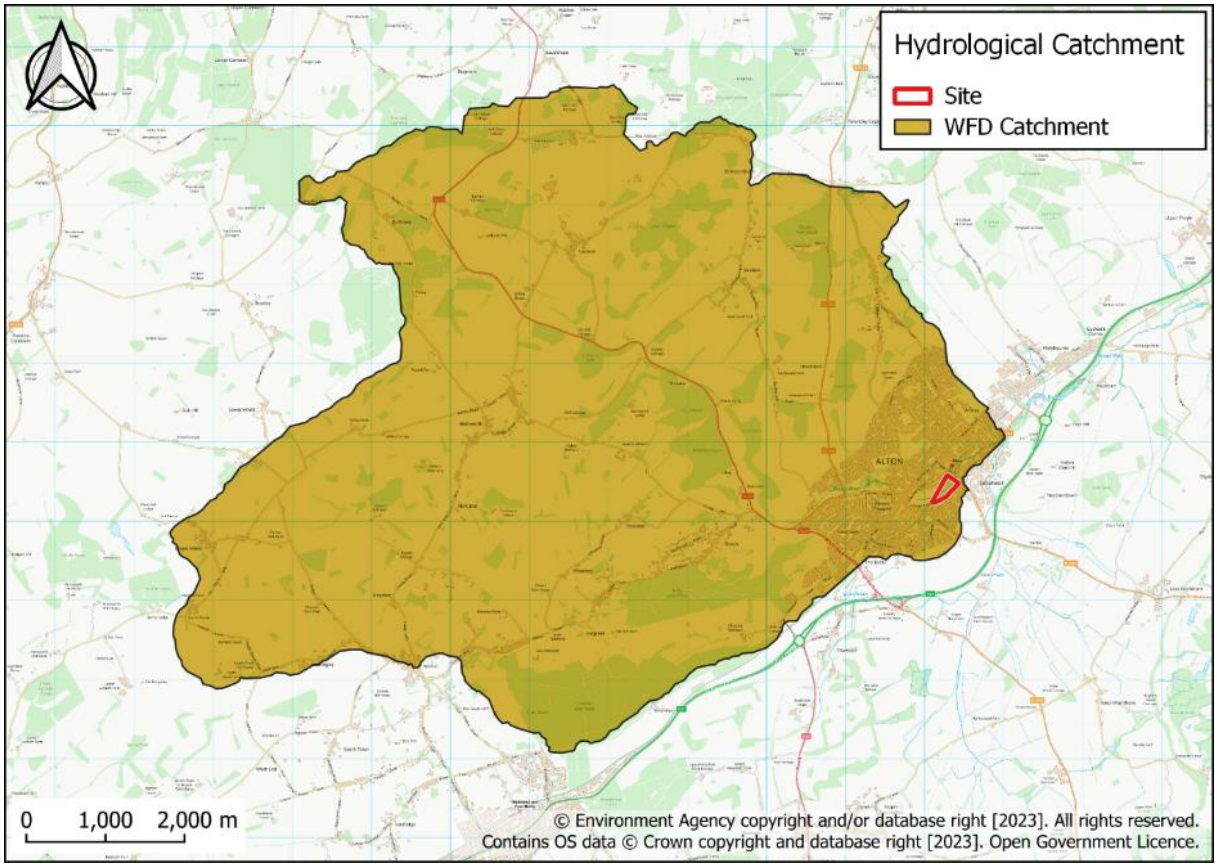


Figure 10 – Hydrological Catchment

3.17 A large proportion of this catchment flows directly through the Kings Pond. The weir at the downstream end is an EA Monitoring Station (3012TH) with a reported catchment area of 45.9km^2 which is 85% of the total catchment area.

3.18 Flow data from this gauging station is available via the National River Flow Archive (NFRA) with a record from 1991-2022 which is 99% complete. It is noted that flow data from April to July 1995 is unavailable due to weed grown, and zero flows are recorded during notable drought when pond levels drop significantly enough to prevent flow downstream.

3.19 The flow regime within the catchment is described as 'baseflow-dominated' but with some urban runoff. The runoff is influenced by groundwater abstraction and/or recharge.

3.20 It is also noted that debris obstructing the upstream grill can cause fluctuations in level. A site visit in November 2022 saw this obstruction (Figure 5), which it is understood that ATC have to clear often as three times per week, increasing to daily during peak leaf fall.

3.21 Gauges daily flow data at the downstream end of the Kings Pond reports a mean daily flow (from 1991-2022) of 0.109m^3/s, with Q95 of 0.001m^3/s ranging up to Q5 of 0.323m^3/s.

Local Geology

3.22 The BGS Geology of Britain mapping suggests that superficial geology beneath the pond is Alluvium (comprising of clay, silt, sand and gravel), over River Terrace deposits (sand and gravel). This follows the River Wey corridor both upstream and downstream. This is designated, by DEFRA Magic Maps, as 'Secondary A' superficial aquifer.

3.23 Bedrock geology beneath the pond is shown to be Zig Zag Chalk Formation, part of the Grey Chalk Subgroup. Upstream, at the source of the River Wey, underlying bedrock is Holywell Nodular Chalk Formation and New Pit Chalk Formation, both part of the White Chalk Subgroup. This is designated as 'Principal' bedrock aquifer.

3.24 In terms of groundwater vulnerability, the King's Pond lies within an area considered to be 'medium-high' vulnerability. This outline follows the extent of the superficial alluvium.

3.25 Given the nature of the superficial deposits beneath the site, it is likely that groundwater is in hydraulic continuity with the watercourse. This allows groundwater to enter the river and also drain from the river during drier periods. At present, the thick silt layer is likely to prevent significant direct interaction with groundwater at the base of the pond, but this relationship should be taking into consideration for any proposed options.

3.26 It is likely that there are areas of Made Ground within the site boundary as a result of previous works in the area. Prior to any physical changes to the pond and / or pond structures, it may be necessary to commission further onsite boreholes to ascertain the structure and stability of underlying ground.

Siltation and Contamination

3.27 A Contamination Assessment Report[2] was undertaken by Ground & Water to provide detailed information on the status of silt within the Kings Pond (included in Appendix C). Site work was completed on 6th November 2023 and comprised the recovery of soil samples from the pond bed in five locations, and collection of two surface water samples at the entrance and exit.

3.28 Trial holes were logged which confirmed to the expected geology, with alluvium deposits noted for the whole depth of trial pits to a depth of 1.20m below water level.

3.29 The contamination assessment noted the presence of asbestos within one water sample, at very low level. Soil samples across the site reported elevated levels of Benzo(a)pyrene, Benzo(b)fluoranthene and Dibenzo(a,h)anthracene. Surface water samples noted that Benzo(b)fluoranthene and Benzo(k)fluoranthene at the exit feature of the pond, and Fluoranthene at the entrance and exit of the pond.

3.30 WEL had a meeting with Ground & Water and ATC on 16th November 2023 to discuss the findings of the contamination report and the implications of this on possible options for the pond. Overall, it was confirmed that, in summary, the findings of the report do not preclude reuse or movement of material within the site. There are no specific areas which should be avoided for change from a contamination perspective.

3.31 The surface water samples indicate that whilst some pollution is originating from within the pond, it also appears that fluoranthene is present prior at the entrance too. This would indicate that the source of this is from the upstream river and / or surface water drains which enter the pond at the southern end. Ground & Water suggested that the likely source of this is road runoff pollution from the urban area, and it is therefore noted that options should be investigated to improve this where possible.

[2] Ground & Water, Kings Pond, Alton - Contamination Assessment Report, Report Ref: GWPR5623/CAR/November 2023, V.1.02

Water Quality and River Habitat

3.32 The River Wey through Alton is classified as 'North Wey at Alton Water Body' which is located at the upstream extent of the Wey Operational Catchment, within the Wey and Trib Management Catchment. This falls within the Thames River Basin Management Plan (RBMP).

3.33 The waterbody is classified as a Heavily Modified Water Body (HMWB). This reflects the physical modifications that have taken place as a result of anthropogenic influence (industrial, flood risk etc.). Whilst it is appreciated that a HMWB can never reach true 'good' status or natural conditions, they are required to strive for improvement to be as close to 'good' status as possible within the constraints of the physical modifications.

3.34 Data from the latest cycle of monitoring (2022, Cycle 3) states that the current overall ecological status of the North Wey at Alton is 'moderate'. This data is included in Table 1.

Table 1 - Catchment Data Explorer Data (2022, Cycle 3)

	North Wey at Alton Water Body
Waterbody Type	River
Waterbody ID	GB106039017800
Hydromorphological Designation	Heavily modified
Length	2.8 km
Catchment Area	54.2 km^2
Current Ecological Status	Moderate overall
Biological Quality	Good
Physio-chemical Quality	Moderate – limited by dissolved oxygen
Hydromorphological Supporting Elements	Overall - supports good Hydrological Regime – does not support good
Supporting Elements (Mitigation Measures Assessment (MMA))	Moderate or less
Specific Pollutants	High
Current Chemical Status	Does not require assessment (Previously at 'fail' status due to Polybrominated diphenyl ethers (PBDE))
Associated Protected Areas	Lower Thames (Cookham Egham Teddington) – Safeguard Zone North Wey (Alton to Tilford) NVZ – Nitrates Directive Kingsclere and Greywell – Nitrates Directive Wey – Safeguard Zone
RNAG or RFD	Sewage discharge (intermittent), urban development and groundwater abstraction – all impact dissolved oxygen Groundwater abstraction – impact on hydrological regime Physical modification – impacts on Mitigation Measures Assessment
Objectives	**Good ecological status (overall) by 2027** Good biological status by 2021 – disproportionately expensive and disproportionate burdens Good MMA by 2027 – low confidence due as 'technically infeasible' **Good chemical status by 2063** – due to chemical status recovery time

3.35 A significant concern for the overall health of the waterbody is dissolved oxygen, which is limiting achievement of 'good' ecological status overall. It is noted that intermittent sewage discharge, urban development and groundwater abstraction are factors, however silt load from the pond and the warming of waters within the pond will undoubtedly be contributing.

3.36 Whilst groundwater abstraction rates and sewage discharge are outside of the control of the project, options for the pond will seek to reduce siltation and keep flow moving to increase oxygenation of the channel.

Asset Plans

3.37 A Desktop Subsurface Utility Report[3] was prepared by Technics in November 2023 which provide a full set of asset plans to inform this feasibility study and further work in the area. This is included in Appendix D.

3.38 A number of underground services were found to be affected by the site proposals; these include:

- Water – Foul / surface water drainage (Thames Water) and potable water supply (South East Water)
- Electricity – Distribution (Scottish and Southern Electricity Network)
- Gas – Distribution (SGN)
- Telecoms – BT Openreach

3.39 Transportation and oil / fuel are shown not to be affected.

3.40 The sewer asset plans show a surface water outfall into the south-west end of the pond, immediately downstream of the railway crossing (as shown in Figure 11). This is shown on the survey in Figure 2 and was seen on site. This is marked as 450mm in diameter and drains the residential area to the west of the pond.

3.41 The site visit confirmed that there is another outfall into the structure at the upstream end of the pond (in addition to the River Wey and surface water drainage outfall), since this is not shown on the asset maps, it is assumed that this is Network Rail track drainage.

3.42 There is a non-Thames Water surface water asset shown close to the Kings Pond car park, located off Ashdell Road (as shown on Figure 12). The majority of the urban area to the south of Ashdell Road drains to the public foul network, with a small private outfall onto the Kings Pond land. Whilst the asset plans identify this as an 'undefined end', the topographic survey suggests that there is a manhole in this location and a 300mm outfall into the pond opposite this manhole.

[3] Technics – Desktop Subsurface Utility Report, Reference: SP231812, Search Date: 13th November 2023.

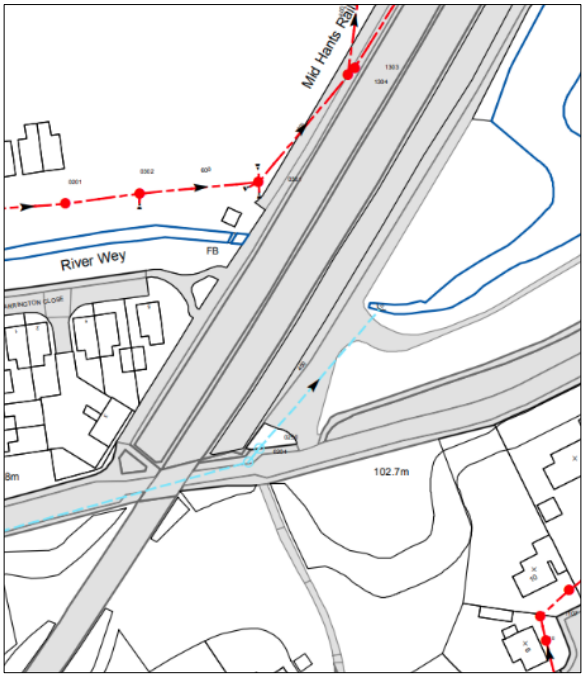


Figure 11 – Upstream SW Asset

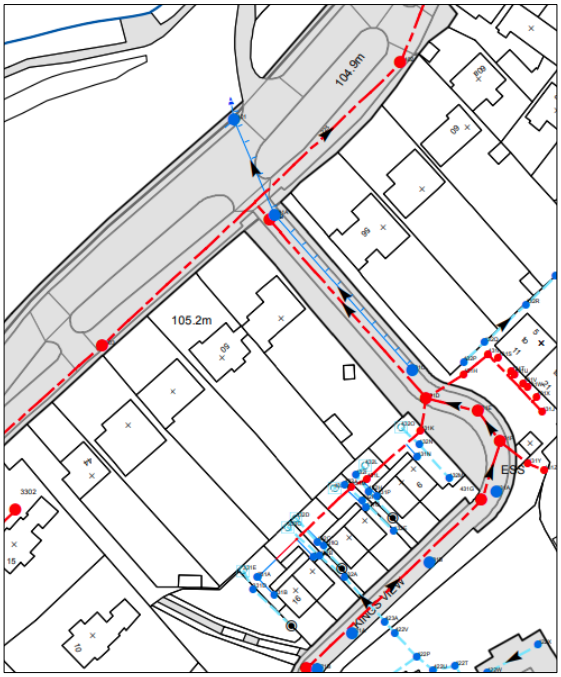


Figure 12 – Ashdell Road Asset

3.43 There are no potable water supply assets within the site boundary, nor any electrical cables.

3.44 There appears to be telecoms services at the downstream end of the pond, within the outlet structure, including a live BT box.

3.45 A medium pressure mains gas supply network is shown crossing the south-western end of the pond, immediately downstream of the inlet structure, marked as 180 PE M/P. An excerpt of the SGN asset plan is shown in Figure 13. Prior to any physical changes to the pond around the inlet structure, further investigation as to the depth and exact location of this asset should be confirmed. Guidance from SGN suggests that hand excavation would be required inside 0.5m of a medium pressure mains.

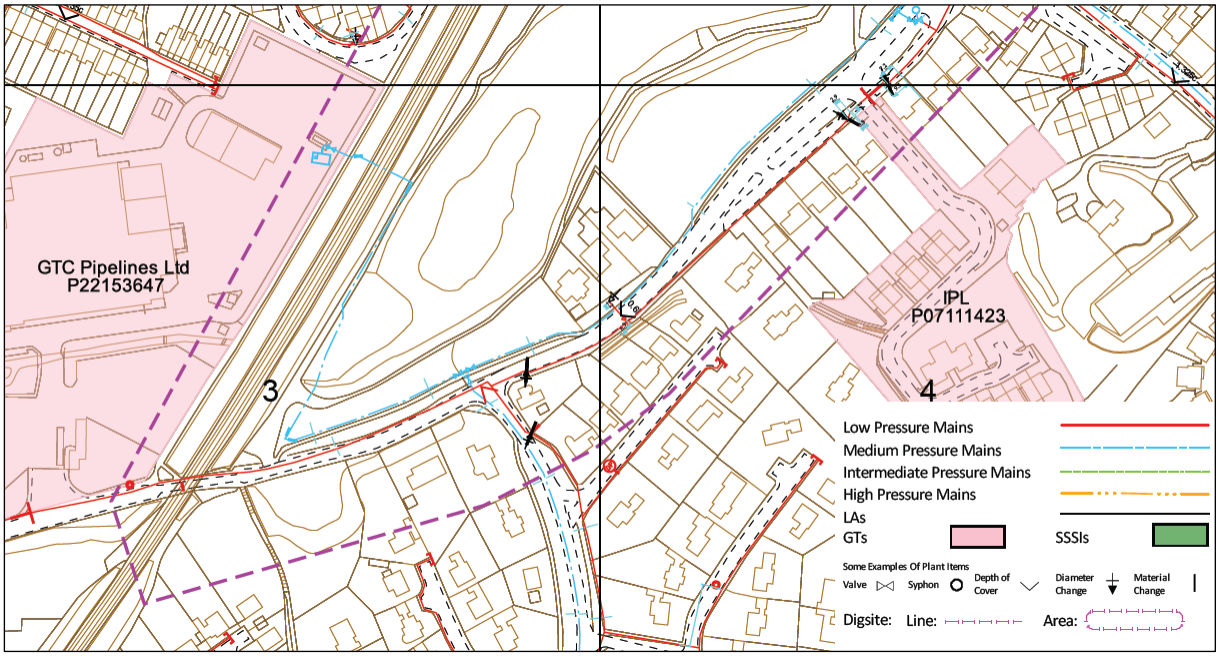


Figure 13 - Except of SGN Asset Map

4 FEASIBILITY ASSESSMENT

Constraints

Local Concerns

4.1 Review of the baseline data has confirmed a number of natural and anthropogenic constraints which have been used to guide the feasibility options reviewed. These include:

- Ensuring that works do not have an impact on downstream flood risk. Whilst previous maintenance work did result in creation of islands and bunds on the pond banks, changes to flood risk policy in recent years means that this would be unacceptable now. There should be no land raising within the flood zone without testing of this scenario via hydraulic modelling.
- The presence of the lake will have an attenuation function in terms of incoming flood flows from the upstream River Wey. The removal and / or modification of the outfall structure, the reduction in pond area and any improvements in conveyance could increase downstream flood risk. This will need to be tested by hydraulic modelling to ensure no offsite impact.
- Runoff from surface water should aim to be intercepted wherever possible to reduce the risk of silt and nutrient load entering the pond. This would include both overland flow and surface water outfalls from the sewer network.
- The pond is likely to be in continuity with the underlying groundwater and further lowering of the pond bed level into the superficial aquifer could result in increased interaction between surface water and groundwater, which the current silt bed helps to minimise. This could result in the pond drying out in the summer months.
- The gas main at the upstream end of the pond may mean that significant alterations around this end are more challenging and this will need to be avoided during construction with hand digging only within an appropriate buffer zone.
- There will be construction constraints with any / all of the more invasive options. This would include the need to avoid the bird-nesting season, and also aim to work when the water levels are lowest.

4.2 It is also understood that the pond and open space is popular with local residents who enjoy the presence of the ducks and geese. We have taken account of popular opinion regarding the wish to retain ducks in this area, which would require a permanent body of water (of some size).

Gradient

4.3 In order to understand the change in bed level, a long section of the existing bed levels has been produced using the detailed topographic survey (shown as green dashed line on the long section drawing ref: 23109-EWK-SK-06 included in Appendix CA). This confirms that the hard bed level (below silt) is 98.97m at the upstream end and 98.62m immediately in front of the weir at the downstream end.

4.4 With only 350mm drop in level across the pond length of 367m, this is a very shallow gradient (approximately 1:1000).

Opportunities

4.5 Working within the constraints identified above, an opportunity is presented to provide a significant improvement to the pond and downstream waterbody. A range of options have been considered which vary from do nothing to a major overhaul of the pond.

4.6 Alongside any of the opportunities presented, further benefits could be offered by:

- Adding areas of wetland at the edges of the pond by planting reeds. This will provide invertebrate habitat and also improve water quality.
- Incorporating planted buffer strips where possible along the banks of the pond to intercept overland flow.
- Continuing to encourage working parties and volunteer groups to litter pick the area and ensure that debris does not end up in the pond.

Potential Options

4.7 A range of potential options have been considered, ranging from least invasive to most substantial, with timescales for delivery and costs increasing as a result.

Option 1. Debris screen improvement

4.8 The existing debris screen at the downstream end of the pond has centres spaced at 50mm. This is very narrow and easily blocked. ATC report that there are large fluctuations in water level behind the screen (of approximately 400mm) as a result of small leaf matter and debris being caught and increasing the water level behind. Currently, this requires maintenance of the screen several times per week, increasing to daily during peak leaf fall in the autumn, which is a significant maintenance burden.

4.9 This fluctuation in water levels and flows is noted at the flow gauge. When the screen is unblocked, large amounts of water, and associated silt, wash into the chamber and the downstream River Wey.

4.10 The existing debris screen is shown in Figure 14, taken during a site walkover on 22nd November 2023 when leaf litter was causing a significant increase in water level.

Figure 14 - Existing Debris Screen

4.11 Modification of the existing debris screen would allow for more consistent regulation of water levels and ensure flows are maintained at a more constant rate. This would provide more stable hydrological regime within the River Wey downstream of the pond and structures and would prevent the sudden influxes of sediment which currently occurs when the screen is cleared.

4.12 It is recommended that CIRIA guidance C786 is used when considering debris screen design. Small organic material passing through should not pose a significant concern provided that larger material is caught to prevent the downstream culvert blocking, in accordance with the CIRIA guidance.

4.13 This option should be relatively low cost and quick to achieve, subject to adhering to CIRIA guidance and negotiation with the EA.

Option 2: Dredging

4.14 Previous dredging work (undertaken by Land & Water in 1996) removed 9,400 m^3 of silt from the pond, which was deposited within and around the pond. As a minimum, and even if no further enhancement opportunities were pursued, a similar exercise would be required in order to clear silt build up from within the pond.

4.15 Using information from the detailed topographic survey, two three-dimensional models were created of the pond; the first to the top of the surveyed silt layer, and the second to the true bed (base of the silt).

4.16 Comparison of these two models confirmed a total estimated silt volume within the pond of 10,100 m^3. This indicates that silt removal of similar scale to the previous dredging exercise would be required.

4.17 Following discussion with ATC, two options were considered:

- **Option 2a: Dredging and removal of silt;** and
- **Option 2b: Dredging and infill of pond.**

4.18 Total disposal off site would removal all 10,100 m^3, however options would need to be considered for the destination of this material and a cost would be associated with this. This option (Option 2a) is shown in Appendix A, drawing ref: 23109-EWK-SK-01.

4.19 In order to avoid offsite disposal, options were considered to try and retain the material onsite. Given previous dredging work, spreading material onto the islands and banks was not considered feasible without significantly changing the landscape of the pond and surrounding open space. Option 2b considers partial infill of the pond on the northern side, retaining a smaller pond area. This retains a wetted pond area but is able to contain up to 8,800 m^3 of silt infill, without the need for removal to landfill, avoiding the cost implications and potential disruption and environmental issues associated with transporting this material offsite.

4.20 Option 2b is shown in Appendix A, drawing ref: 23109-EWK-SK-02. An excerpt of the sketch is shown in Figure 15.

4.21 This indicates the location of the proposed infill and the total volume, should the area be filled to a level of 99.8m AOD. The space available is less than the total silt volume within the pond, however it illustrates a proof of concept, and it is shown to be sufficient to accommodate dredging from the main pond area, excluding the site channel on the northern side of the island, which could remain un-dredged.

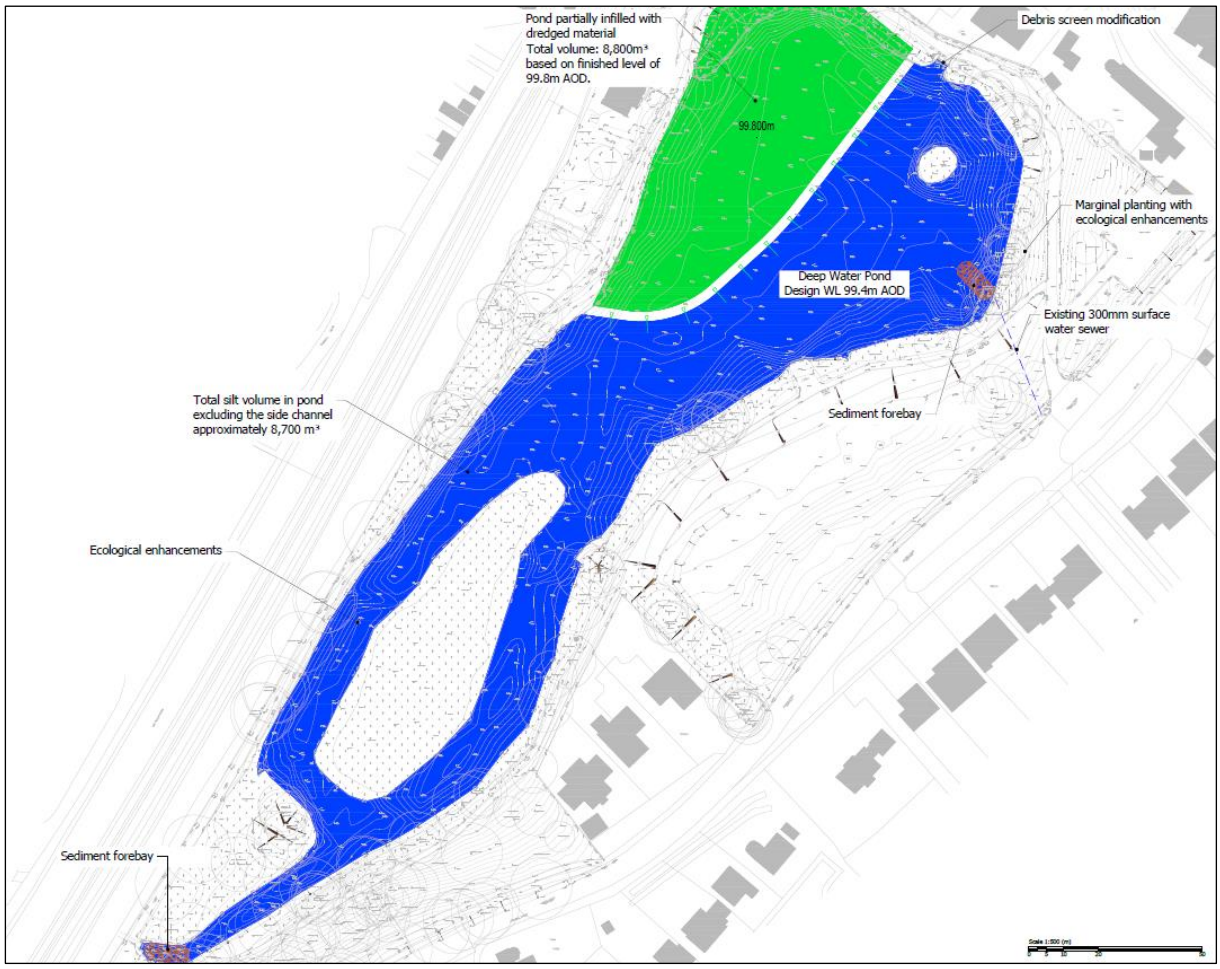


Figure 15 - Except of Option 2b

4.22 Neither dredging option would reduce the long-term silt accumulation problem.

Option 3: Removal of weir

4.23 Removal or modification of the existing weir and sluice would allow for regulation of water levels and flow. This would effectively lower the point of outfall to the bed level (98.62m), a reduction from the current weir level of 99.35m (700mm drop). This could be done in conjunction the modification to the debris screen to improve flow.

4.24 If the weir were to be removed, there would be a few possible options depending on the desired level of intervention within the pond.

Option 3a: Removal of weir and do nothing

4.25 By dropping the water level in the pond, this would effectively allow the flow through the pond to find its own natural channel and the area of standing water (the existing pond area) would reduce. However, it would potentially take considerable time for the flow to cut a natural channel (ranging from months to years), during which there will be a significant adverse effect on the visual amenity of the pond.

Option 3b: Removal of weir and creation of smaller online pond

4.26 It would be preferable to undertake intervention on the pond in conjunction with removal or modification of the weir since this presents an opportunity to modify the existing pond and channel features around the island at the southern end. Material exposed by reduced water levels

could be used to modify the pond and channel size and shape. This will result in a smaller online pond and a single defined channel at the southern end upstream.

4.27 The benefits of this approach are that a larger area of the pond remains in place with less in-water works. Landscaping would be required to finish this work to an acceptable visual standard. This could also serve as a potential interim option prior to the more extensive option suggested below.

4.28 Risks associated with this option are that the EA have expressed interest in an offline pond and restoration of the chalk stream channel. The retention of the online pond also means that wild fowl pollution would still be a direct impact on the general water quality and health of the River Wey downstream.

Option 3c: Removal of weir, creation of offline pond and river channel

4.29 The most extensive option considers the removal or modification of weir and debris screen to regulate water levels, followed by the creation of a separate offline pond and river channel throughout the existing pond area. The offline pond levels would be regulated by overflows from the river, maintaining the public amenity whilst improvement water quality in the channel. In addition, there is an existing surface water outfall into the eastern side of the pond which could serve as a source of water.

4.30 This option is illustrated in Appendix A, drawing ref: 23109-EWK-SK-03. An excerpt of this sketch is shown in Figure 16.

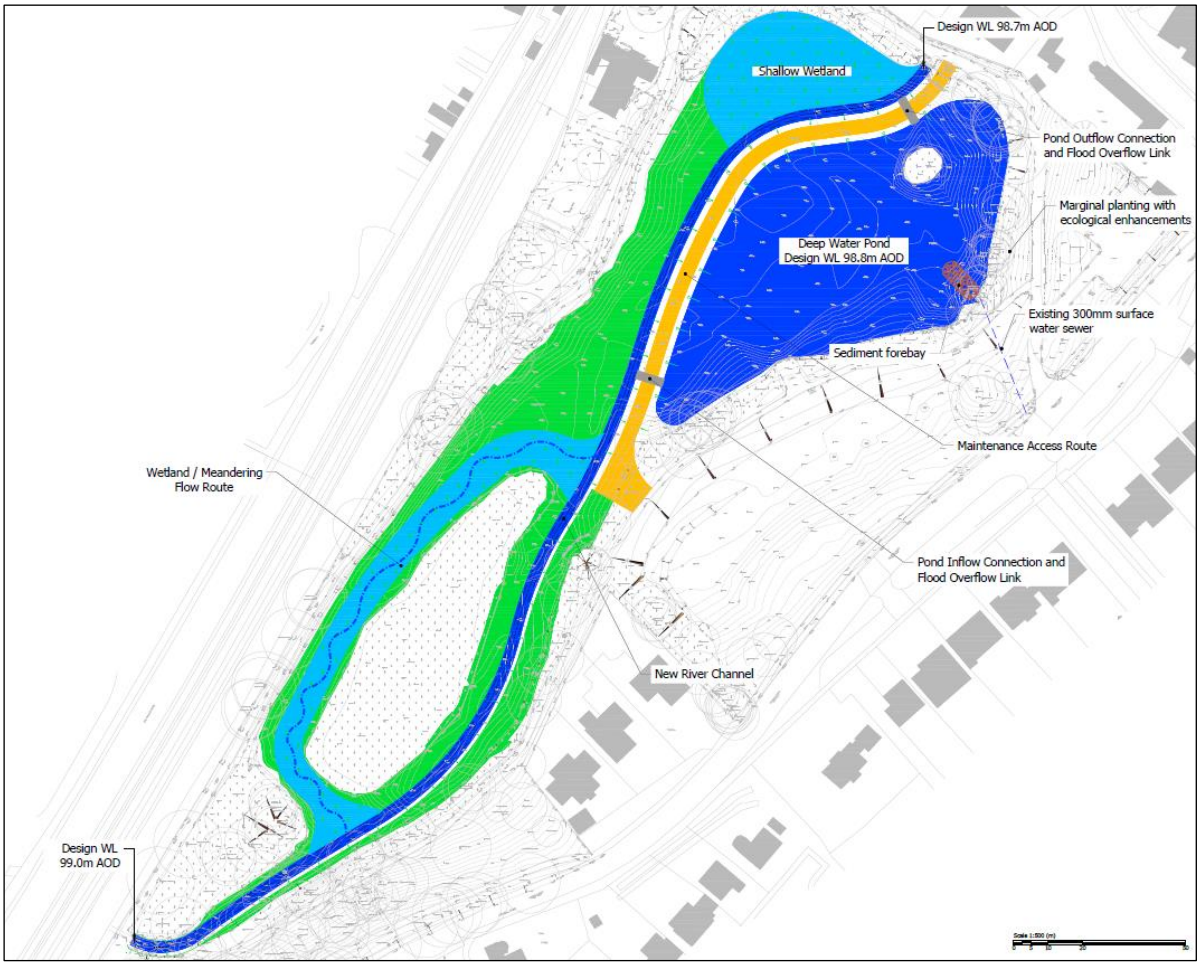


Figure 16 - Excerpt of Option 3c

4.31 This option aims to fully restore this stretch of river to a gravel bed natural chalk stream. Whilst the River Wey is significantly urbanised throughout Alton, examples of meandering channels with gravel beds are seen immediately upstream, prior to entering the pond. These features have been reinstated as part of recent local improvement works and provide enhanced habitat, contributing towards overall betterment within the waterbody. These are shown in photographs Figure 17 and Figure 18. Option 3c would aim to replicate as many of the more 'natural' channel features as possible, within the constraints of the space available.

4.32 The island present within the pond would be maintained, with a main channel defined along the southern boundary and a wetland / meandering backwater encouraged along the northern side, with remains connected to the main channel.

4.33 To increase habitat and biodiversity within the site, it is proposed that a two-stage channel is created at the northern end. This would aim to maintain the hydrological integrity and continuity of the stream, even at lower flows. An additional area of wetland is proposed on the northern bank to further improve habitat for invertebrates.

4.34 Separating the pond and river allows the site to benefit from the creation of a chalk stream channel with a natural bed, whilst avoiding silt accumulation in the pond and also improving water quality in the downstream River Wey.

Figure 17 – Upstream Meandering Channel

Figure 18 – Upstream Gravel Bed

4.35 This option would contribute directly to improvements to the overall health of the waterbody and contribute towards achievement of 'good' status under the WFD. Water quality benefits could include:

- Improvements to biological habitat through creation of natural channel bed, marginal planting, and wetland creation;
- Reducing sedimentation downstream, providing a more natural and continuous flow regime which would increase oxygenation of the river and avoid increases in temperature through removal of the online pond;
- Improvements to the hydrological regime through restoring a more 'natural' continuous flow pattern.

4.36 This option would also provide public amenity through retention of the pond and presenting opportunities to create a new grass space if desired.

4.37 Material gathered from the desilting of the pond could potentially be used to improve the channel structure and shape. This is subject to appropriate geotechnical review of the material and design of the banks.

4.38 Risks associated with this option are that the site lacks gradient as the existing pond is very flat (approximately 1:1000), even with removal of the weir. This results in the river needing a relatively straight planform, to keep the distance short, with limited opportunity to further meander the watercourse.

4.39 Total removal of the weir down to the base level in the chamber (98.62m AOD) is the only realistic option for creating a channel through the existing pond area upstream. Modifying the weir with a higher sill level would be detrimental as it would mean an even flatter long sectional bed profile upstream. The sluice gate could also potentially be removed; however, this is unlikely to provide much benefit to the preferred scheme as removing the weir provides a reasonable flow width for the channel to discharge through and into the existing chamber downstream.

4.40 Hydraulic modelling of this option would be required to ensure that downstream changes in flood regime as a result of the weir removal are known and understood.

Option 4: Modification of outlet

4.41 Whilst Option 3c provides numerous benefits, it is constrained by the base level within the chamber at the outlet from the pond which is set at 98.62m AOD. The weir is currently set at 99.35m AOD. A level of 98.62m AOD is the lowest level that can be achieved without modifying the outlet chamber structure and downstream network of culverts and channels. The Waterside Court drainage plan[4] shows the surface water drainage network, downstream of the pond, to consist of:

- The outlet from the pond via 2 x 450mm diameter concrete pipes which discharge into Chamber 1. The drawing suggests that the invert level of the incoming pipes is 98.35m AOD and the chamber has an invert level of 97.161m AOD (this is potentially an error – see Chamber 2 below).
- Chamber 1 which discharges via 2 x 675mm diameter pipes laid at 1/80 into Chamber 2 with an invert level of 97.440m AOD (this is higher than the invert level in Chamber 1, but broadly consistent and reasonable with downstream invert levels and therefore it is presumed that the invert level of 97.161m AOD in Chamber 1 is an error)
- A network of open channels and culverts downstream of Chamber 2.

4.42 Figure 19 shows an excerpt of the Waterside Court drainage plan illustrating the above description. A full copy of the drainage plan is found in Appendix A.

[4] Grove Consultants Ltd (August 1988) Alton. Drainage Layout. Wimpey Homes Holdings.

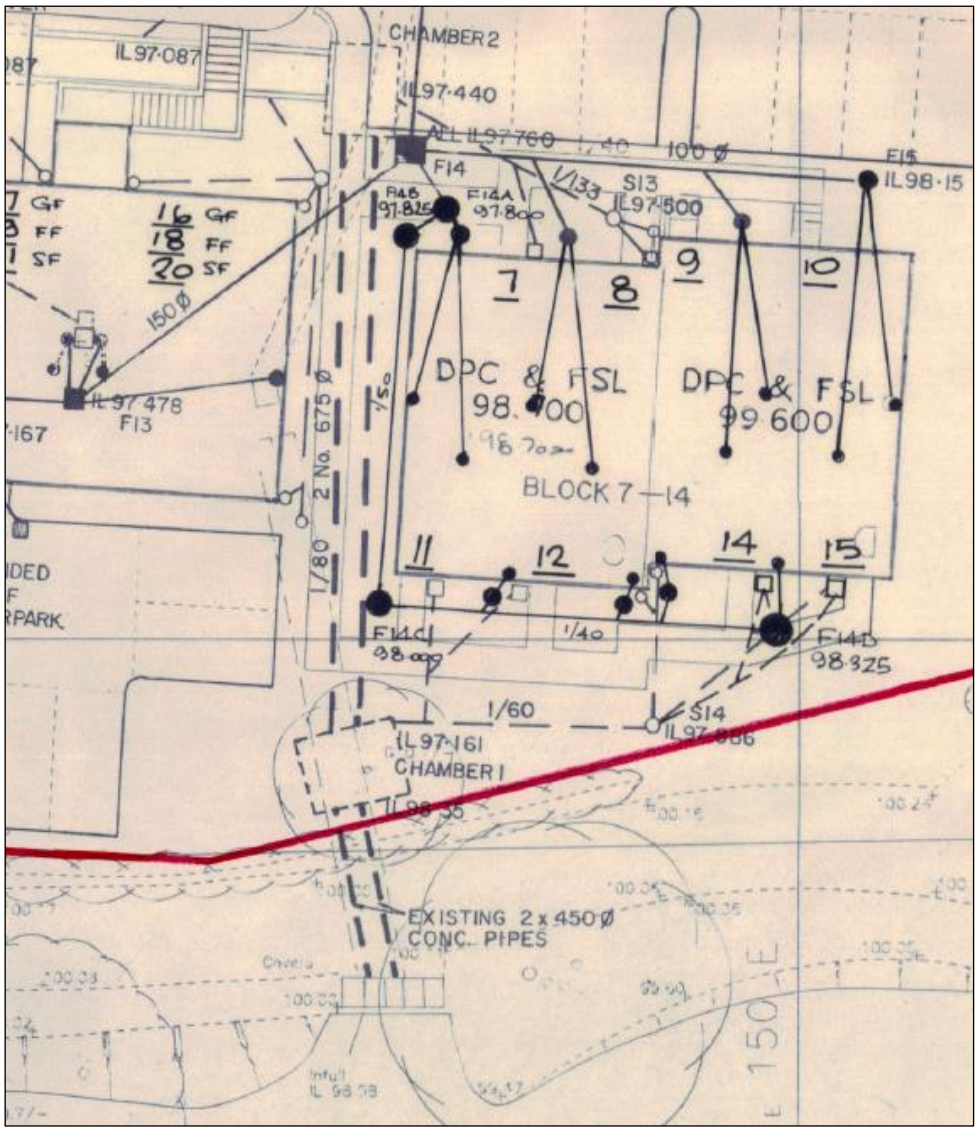


Figure 19 - Waterside Court Drainage Excerpt

4.43 In order to maximise the opportunities for creation of a channel through the existing pond area, a further option would be to modify the existing pond outlet structure and 2 x 450mm diameter pipes conveying flow into Chamber, as well Chamber 1 itself. Despite the presumed error with regards to the invert level of Chamber 1, there appears to be a relatively significant fall from the pond outlet chamber containing the weir and sluice into Chamber 1. It may therefore be possible to break out the 2 x 450mm pipes, modify the existing outlet chamber to lower the base level (this would require modification or removal of the sluice, in addition to the weir), install two new pipes at a lower level (or repurpose the existing pipes if they are fit-for-purpose), and modify Chamber 1.

4.44 The ownership of Chamber 1 has not yet been established and this would need to be investigated and considered if this option is pursued further.

4.45 Modification of the outlet offers maximum flexibility for redesign for a river channel within this area. Options for a more sinuous channel with a) ponds and b) wetland areas are explored below.

Option 4a: Modification of outlet, longer river channel and offline pond(s)

4.46 Lowering the invert level of the outgoing structure(s) would allow for a greater fall in the proposed channel from the upstream end of the pond. This would provide greater flexibility in the channel plan form and layout to maximise sinuosity as the bed level could be lowered relative to the previous option (Option 3c).

4.47 Option 4a is presented in Appendix A, drawing ref: 23109-EWK-SK-04. An excerpt of this sketch is shown in Figure 20.

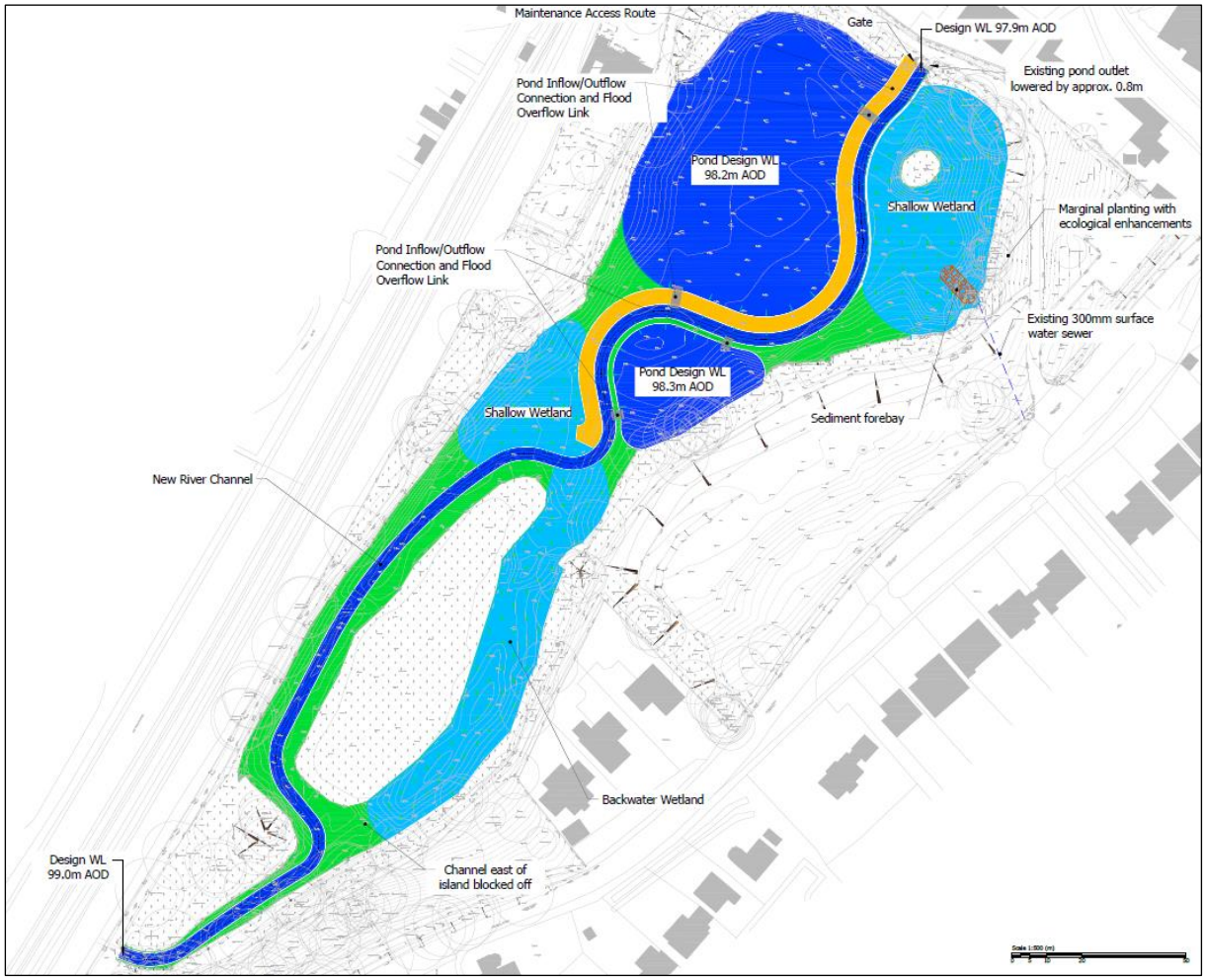


Figure 20 - Excerpt of Option 4a

4.48 Further lowering the bed level of the channel relative to Option 3 would allow for opportunity to create a longer and more sinuous planform of the new river channel, with more flexibility in the design. This would increase the area of gravel bed habitat and could allow for greater variation in bankside habitat through (for example) provision of inlets for fish refuge, areas of multi-stage banks and small mid-channel islands to vary flow patterns. The wider the range of flow variability provided, the greater the range of habitat.

4.49 The proposed areas of backwater and inclusion of multiple ponds and / or wetland areas allow for a variety of planting types. Option 4a presents opportunities for both a public facing pond along the southern boundary, and also for an additional pond at the northern side of the site which is inaccessible to members of the public. This would provide a quiet 'nature' pond with little / no disturbance from people or dogs.

4.50 Option 4a presents the best opportunity for betterment, through the increased flexibility in the design that a greater fall in bed gradient offers. However, the level of engineering work would potentially be considerably more extensive with associated increase in costs compared to Option 3c.

4.51 As per previous options, hydraulic modelling would be required to ensure that impacts on flood risk downstream are known and mitigated if required.

Option 4b: Modification of outlet, longer river channel and wetland

4.52 A final option was considered, removing the larger pond and replacing this with a further area of shallow wetland. This would provide all the same benefits to the river as Option 4a but removing a further large area of pond. The wetland areas would provide benefit to invertebrates and allow for wetland planting.

4.53 The areas of shallow wetland would be infilled relative to the existing pond depth, allowing any excess fill leftover following creation of the new sinuous river channel to be distributed on site. This option maximises the chances of reducing, or removing, the wildfowl pollution problem.

4.54 Option 4b is presented in Appendix A, drawing ref: 23109-EWK-SK-05. An except of this sketch is shown in Figure 21.

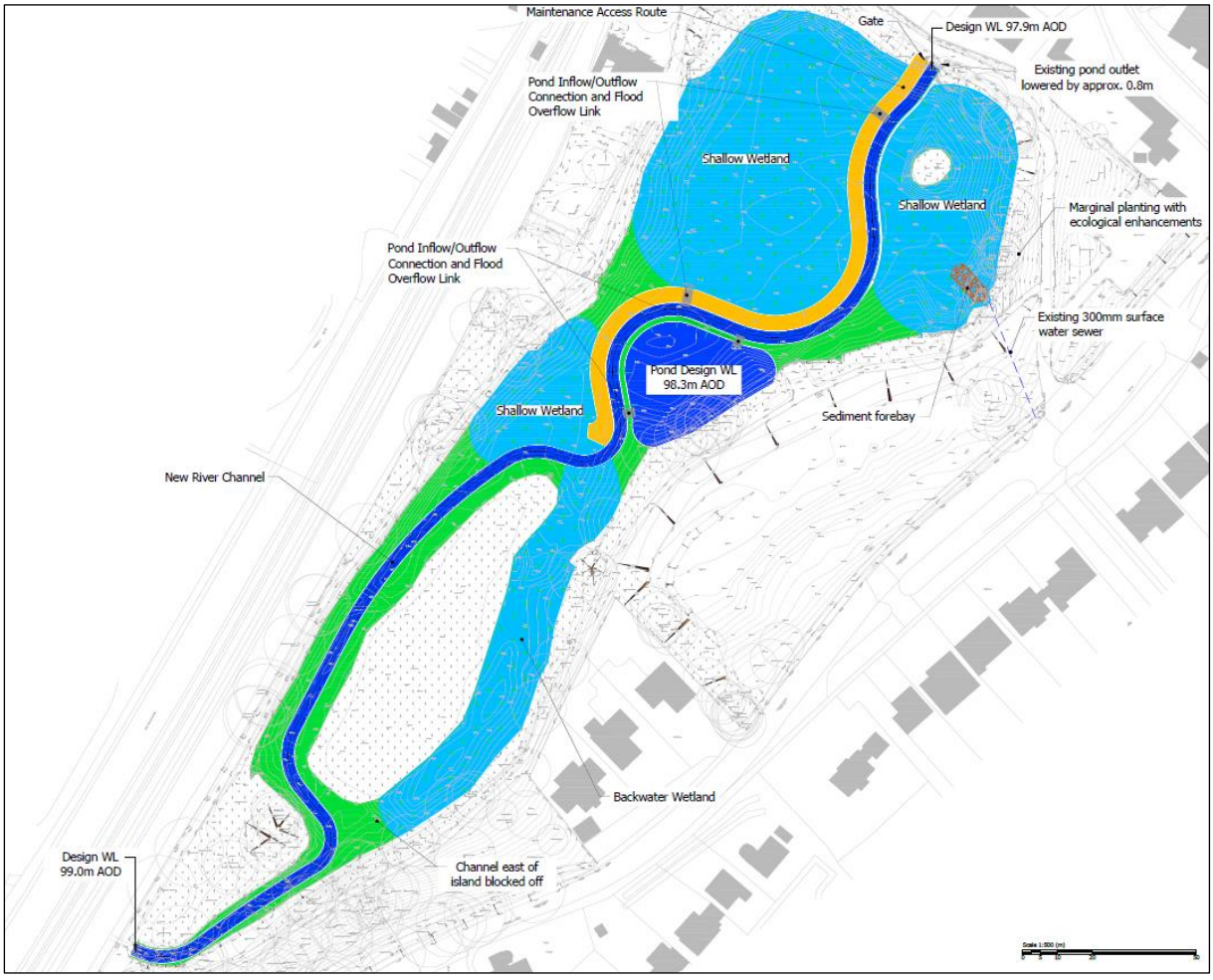


Figure 21 - Excerpt of Option 4b

Further Assessment Requirements

4.55 To progress the design options for the proposed changes to Kings Pond, the following additional studies/work will be required:

- Improvements to the hydraulic model baseline, including:
  - Upgrading the 1d-only model to a 1d-2d combined model (including a 2d model reach extending from Draymans Way to approximately 200m downstream of Papermill Lane), representing the existing pond in the 2d domain.
  - Improved representation of the existing pond outfall, to reflect the existing permanent thin plate weir and adjacent penstock.
  - Improved representation of the open channels and culverted sections of the downstream channel through Papermill Lane.
  - Incorporation of the new development and changes to the watercourse upstream of the pond.
- Testing of proposed option(s) within the hydraulic model to ensure no impact on flood risk downstream of Kings Pond.
- Internal survey of the existing outfall structure and existing thin plate weir.
- Inspection and maintenance of the existing penstock.
- Onsite boreholes to determine ground conditions and groundwater levels, including installation of permanent boreholes to determine long-term changes to groundwater levels.

Estimate of Likely Costs

4.56 Debris screen modification is likely to be a relatively low, and therefore cheap intervention. Costs will depend on whether the existing screen can be modified or whether a new screen needs to be manufactured. Costs for the physical works are estimated at £5k - £10k. This excludes the consulting costs for screen design which could be of similar order, but at the low end of the range.

4.57 The modifications and/or removal of the weir structures within the pond outlet structure could adversely affect flood risk downstream. As such any modifications will need to be assessed using hydraulic modelling, which will determine what modifications can be made. The costs of hydraulic modelling are typically in the order of £10k but costs do depend on the scope of works agreed with the EA.

4.58 The costs of the works to the outfall structure would depend on what can be undertaken without adversely impacting flood risk. As such the works and costs set out below are provided for an assumed condition where changes are proposed to the existing thin plate weir only.

4.59 The assumptions regarding the works to the outfall structure are as follows:

- Any works to the weir would be undertaken during the works to the wider pond and as such additional site requirements such as welfare facilities, etc. can be ignored.
- Any intermittent requirement for heavy lifting plant/machinery could be provided by the wider works.
- The existing penstock is in good working order and can be used.

- The water levels in the upstream pond have been lowered to the design level, using the penstock before outfall works are initiated.

4.60 The assumed works to the outfall structure are as follows:

- The works concern the existing thin plate steel weir on the left side of the outfall
- The changes include either removing the steel plate weir in its entirety or replacing the weir with a modified shape, e.g. a v-notch weir extending down to bed level.
- Based on limited information at this stage the costs are estimated at approximately £10k - 25k for the physical works.

4.61 The costs for the replacement weir (if required) have been ignored, as well as any maintenance (if required) to the existing penstock to enable its use.

4.62 The groundworks associated with the major works options (Options 3c and Option 4a/b) would form the bulk of costs (relative to removing the weir) and depends significantly on the scheme taken forward, which could range from no intervention in the pond (weir modification only), low intervention (smaller online pond), to medium/large invention (offline pond and channel creation) depending on the extent of associated amenity and landscaping proposals. Based on the limited information available at this time, it is very difficult to provide a robust estimate of costs, but they could range from £100k - £500k, or higher if significant amenity and landscaping proposals are incorporated. Costs also depend significantly on whether:

- arisings from the dredging can be reused onsite, or need to be disposed of offsite;
- any construction material needs to be imported (likely for the channel/pond bund);
- any liners are required (e.g. to cap the bund to prevent erosion in the event of overtopping

4.63 The costs of modifying the downstream structure(s) depend primarily on whether Chamber 1 is on third party land, and whether there is a ransom situation for modifying the chamber. If not, and the chamber can be easily accessed then the costs of modifying the downstream infrastructure are estimated at approximately £100k. This is only a ballpark figure and is based only on the drawing of the Waterside Court drainage and no further strategy or design work has been completed at this stage.

5 SUMMARY OF POTENTIAL OPTIONS

5.1 Following a walkover of the site, collation of all baseline data and discussions with ATC, a range of potential options for the Kings Pond have been proposed. These outline options take into consideration known constraints and desired opportunities.

5.2 The required intervention (i.e. level of work needed) and therefore resulting costs increase from Options 1 to 4. A summary of the potential options, with likely benefits and expected risks / compromises are presented in Table 2.

Table 2 - Summary of Potential Options

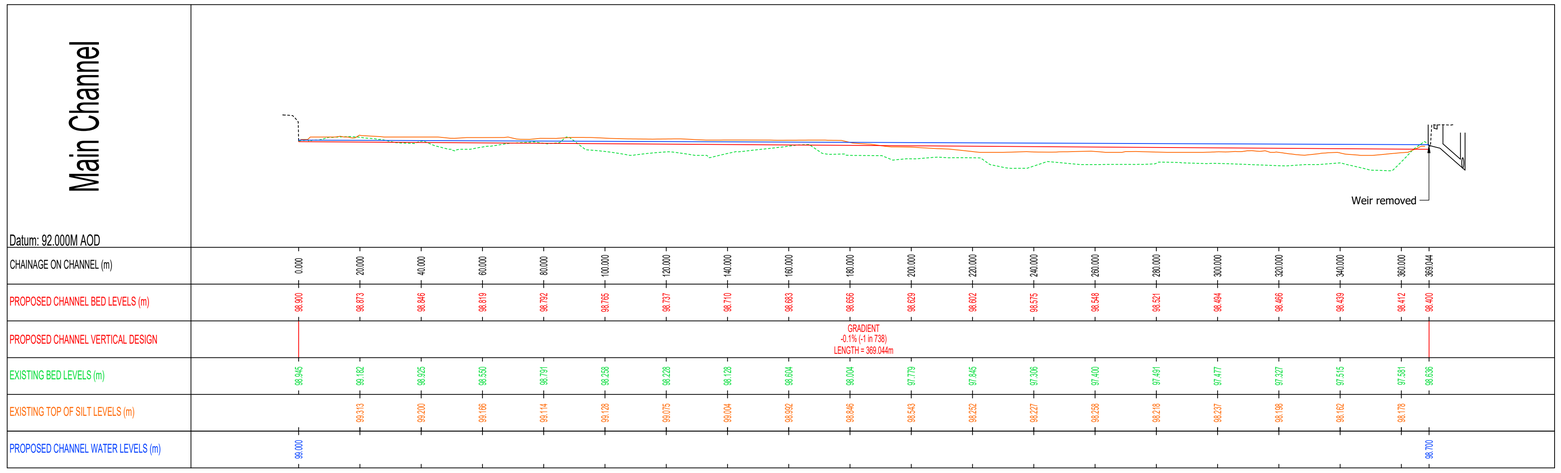
Option		Expected Benefits	Risks and Compromises
1	Debris screen improvement	Water level regulation and minor improvements to flow regime and silt influxes downstream. Reduced maintenance in clearing of debris screen. Low-cost solution, minimal work required.	No specific changes to the pond so online issues of siltation and water quality remain.
2a	Dredging and removal of silt	Reduced silt depth within the pond. No further landscaping works required.	Potential cost associated with removal to landfill. Disruption and environmental impact of transporting offset. Online pond issues would remain.
2b	Dredging and infill of pond	Reduced silt depth within the pond. Reduced cost and offsite disruption compared to landfill option.	Online pond issues remain, no improvement to siltation overall so future maintenance will be required. No WFD benefits to river.
3a	Removal of weir and do nothing	Water level reduction, stabilising water levels and flows. Lower water levels would encourage emergence of natural channel bed over time.	Likely to take a long-time for flow to cut a natural channel with significant adverse impact on visual amenity in the interim. Online pond issues would remain.
3b	Removal of weir and creation of smaller online pond	As Option 2a, plus creation of a natural channel at the southern end of the pond. Minor localised benefits to in-channel habitat through provision of new river bed and banks.	The online pond would remain a barrier to significant improvement to waterbody health, and therefore benefits provided by new open river section are limited.

Option		Expected Benefits	Risks and Compromises
3c	Removal of weir, creation of offline pond and river channel	As Option 2a plus option to re-establish chalk stream and provide new in-channel habitat. Additional habitat to be created via backwater and wetland areas. Removal of online pond and wild fowl pollution will remove pollution from downstream waterbody. Maximises amenity and landscaping options.	Potential for increases in flood risk downstream which will need to be modelled and addressed (if required). General change to watercourse deposition characteristics, potential for silt downstream. Higher-cost solution, with significant local disruption to complete.
4a	Modification of outlet, longer river channel and offline pond(s)	As per Option 3c, plus increased fall across the pond area provides opportunity to maximise channel sinuosity and increase associated habitat creation. More sinuous river option allows for provision of multiple smaller offline ponds and wetlands. Whilst some would remain public facing, also opportunity for quiet nature ponds with limited / no public access.	As per Option 3c, with further costs associated with engineering work. Chamber 1 downstream is located on third party land.
4b	Modification of outlet, longer river channel and removal or larger pond to create more wetland	As per Option 4a, but infilled areas of shallow wetland could allow opportunity to retain larger volume of fill on the site, removing need for offsite transport to landfill. Best option to resolve wildfowl pollution problem.	As per Option 4a. May be viewed as less appealing than Option 4a due to loss of further pond area.

APPENDIX A: DRAWINGS

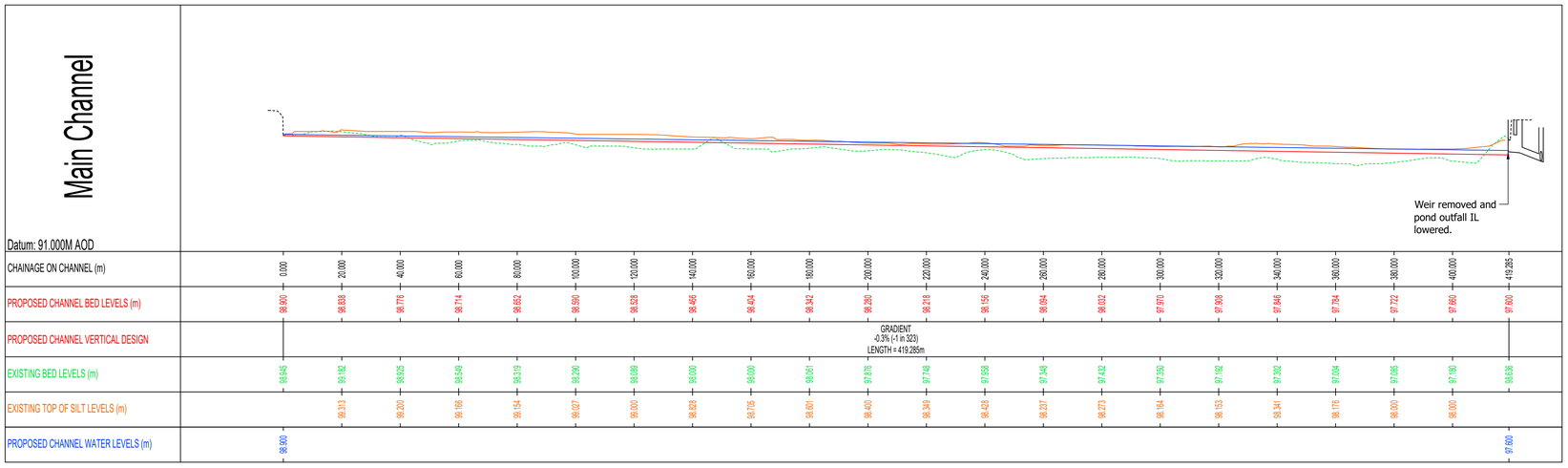
The following drawings are referenced within the body of this report:

- Water Environment Ltd (February 2024) Alton Town Council, King's Pond, Feasibility Study Channel Long Sections, Ref: 23109-EWK-SK-06 C01
- Water Environment Ltd (February 2024) Alton Town Council, King's Pond, Feasibility Study Layout Option 2a, Ref: 23109-EWK-SK-01 C01
- Water Environment Ltd (February 2024) Alton Town Council, King's Pond, Feasibility Study Layout Option 2b, Ref: 23109-EWK-SK-02 C01
- Water Environment Ltd (February 2024) Alton Town Council, King's Pond, Feasibility Study Layout Option 3c, Rev: 23109-EWK-SK-03 C01
- Grove Consultants (August 1988) Alton, Drainage Layout, Wimpey Homes. Ref: H73 B 125 720I
- Water Environment Ltd (February 2024) Alton Town Council, King's Pond, Feasibility Study Layout Option 4a, Ref: 23109-EWK-SK-04 C01
- Water Environment Ltd (February 2024) Alton Town Council, King's Pond, Feasibility Study Layout Option 4b, Ref: 23109-EWK-SK-05 C01



OPTION 3C - CHANNEL LONG SECTION

H Scale: 1:1000 / V Scale: 1:200



OPTION 4A/B - CHANNEL LONG SECTION

H Scale: 1:1000 / V Scale: 1:200

NOTES

1. Dimensions in metres and levels in m AOD unless otherwise stated. Do not scale.
2. To be read in conjunction with the Weir Removal Feasibility Study (ref. 23109-HMD-RP-01) by Water Environment.
3. Based on topographic survey undertaken by Rigour Survey in November 2023.

PRELIMINARY

REV	DATE	AMENDMENTS	DRAW	APPR
C01	09.02.24	Final issue.	GE	GL

WATER | ENVIRONMENT
6 Coppergate Mews · Brighton Road · Surbiton · London · KT6 5NE
Tel: 020 8545 9720
Email: contact@waterenvironment.co.uk
Web: www.waterenvironment.co.uk

CLIENT: Alton Town Council

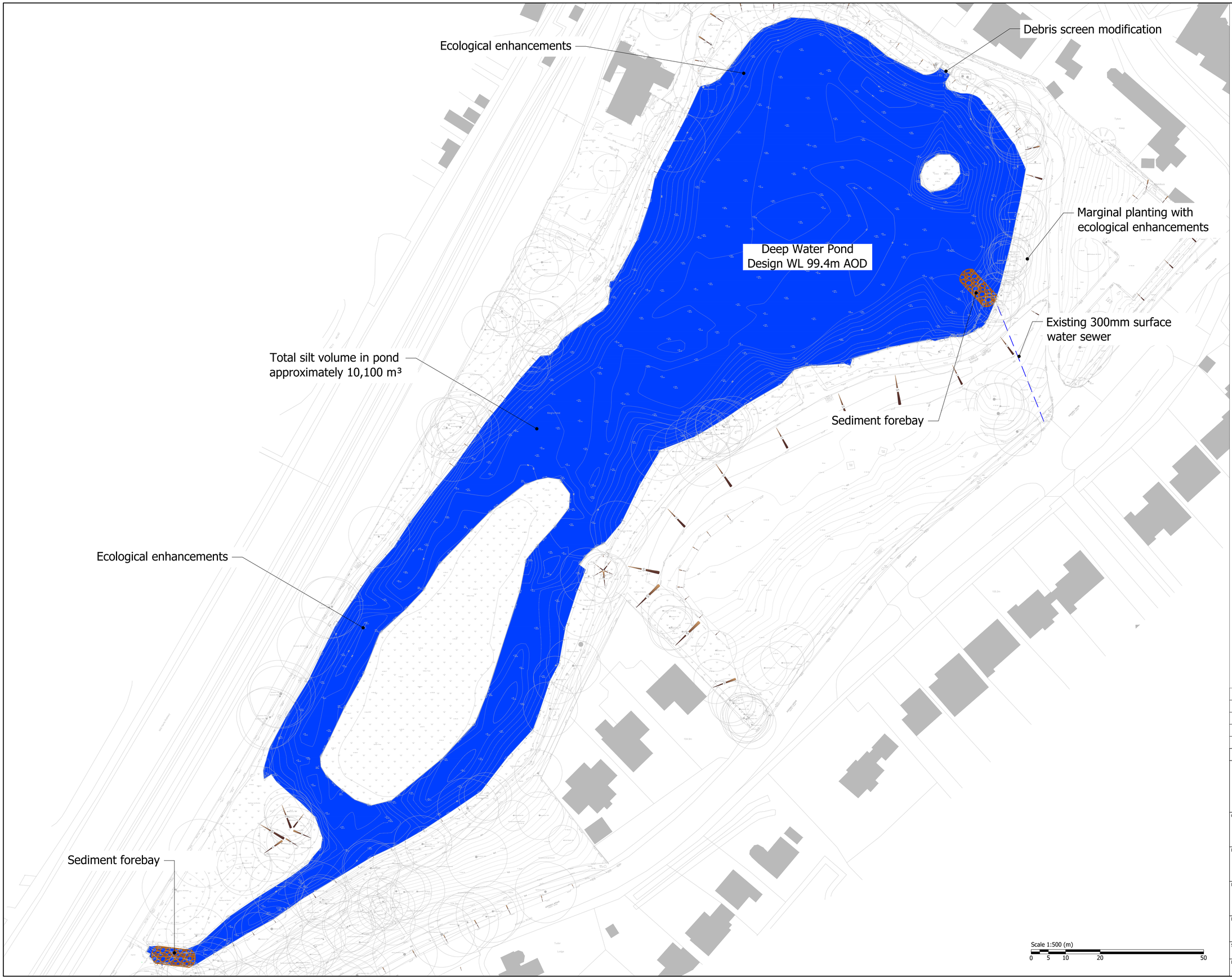
PROJECT: King's Pond

DRAWING: Feasibility Study
Channel Long Sections

DRAWING NUMBER:	REVISION:
23109-EWK-SK-06	C01

SCALE @A1:	DATE:
1:500	09/02/2024

DRAWN BY:	CHECKED BY:	APPROVED BY:
GE	DM	GL



NOTES

1. Dimensions in metres and levels in m AOD unless otherwise stated. Do not scale.
2. To be read in conjunction with the Weir Removal Feasibility Study (ref. 23109-HMD-RP-01) by Water Environment.
3. Based on topographic survey undertaken by Rigour Survey in November 2023.
4. Any changes to ground and water levels are subject to detailed impact assessment.

N

PRELIMINARY

REV	DATE	AMENDMENTS	DRAW	APPR
C01	09.02.24	Final issue.	GE	GL

WATER | ENVIRONMENT
6 Coppergate Mews · Brighton Road · Surbiton · London · KT6 5NE
Tel: 020 8545 9720
Email: contact@waterenvironment.co.uk
Web: www.waterenvironment.co.uk

CLIENT: Alton Town Council

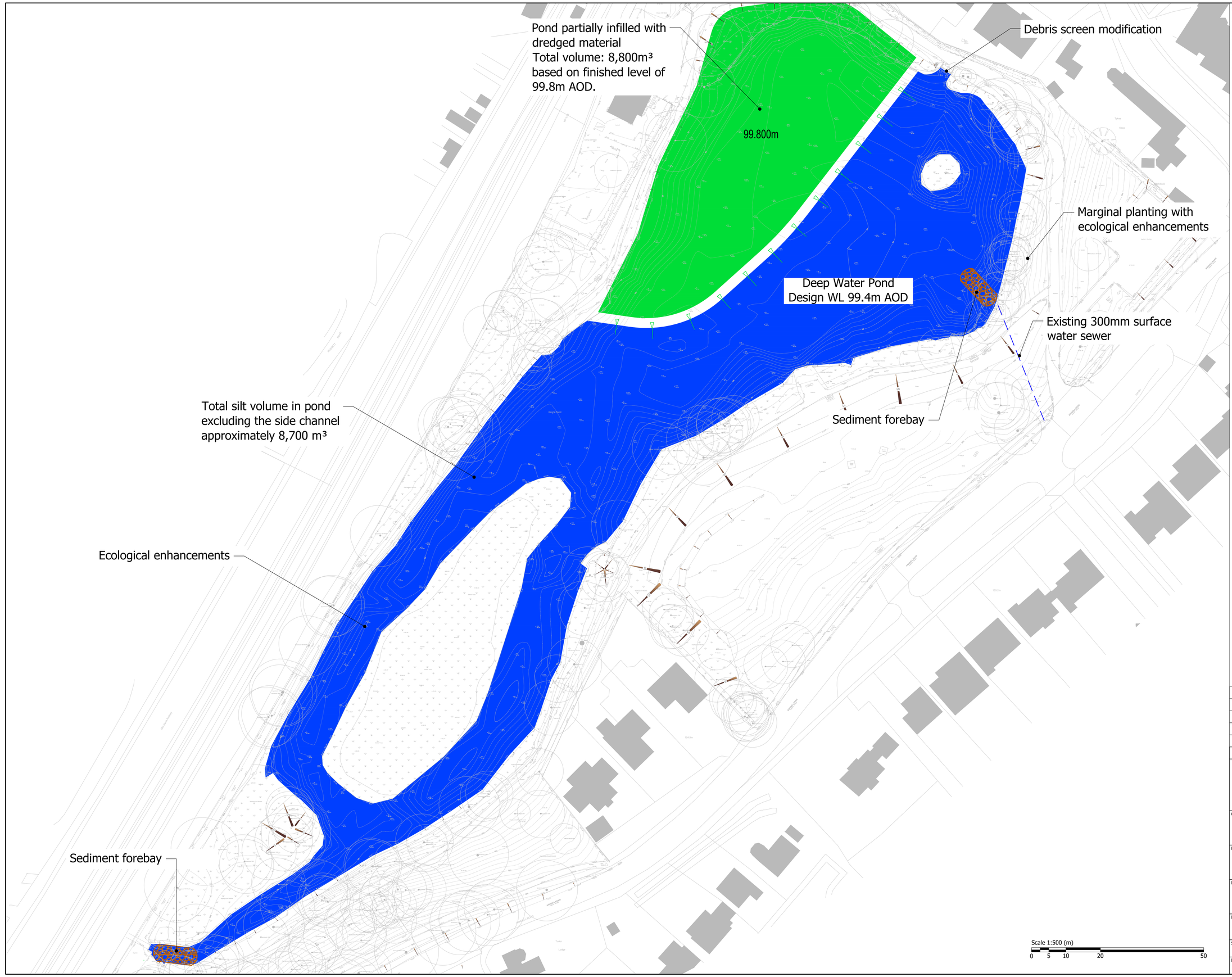
PROJECT: King's Pond

DRAWING: Feasibility Study Layout Option 2a

DRAWING NUMBER:	REVISION:
23109-EWK-SK-01	C01

SCALE @A1:	DATE:
1:500	09/02/2024

DRAWN BY:	CHECKED BY:	APPROVED BY:
GE	DM	GL



NOTES

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2. To be read in conjunction with the Weir Removal Feasibility Study (ref. 23109-HMD-RP-01) by Water Environment.
3. Based on topographic survey undertaken by Rigour Survey in November 2023.
4. Any changes to ground and water levels are subject to detailed impact assessment.

N

PRELIMINARY

REV	DATE	AMENDMENTS	DRAW	APPR
C01	09.02.24	Final issue.	GE	GL

WATER | ENVIRONMENT
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Tel: 020 8545 9720
Email: contact@waterenvironment.co.uk
Web: www.waterenvironment.co.uk

CLIENT: Alton Town Council

PROJECT: King's Pond

DRAWING: Feasibility Study Layout Option 2b

DRAWING NUMBER:	REVISION:
23109-EWK-SK-02	C01

SCALE @A1:	DATE:
1:500	09/02/2024

DRAWN BY:	CHECKED BY:	APPROVED BY:
GE	DM	GL

NOTES

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N

PRELIMINARY

REV	DATE	AMENDMENTS	DRAW	APPR
C01	09.02.24	Final issue.	GE	GL

WATER | ENVIRONMENT
6 Coppergate Mews · Brighton Road · Surbiton · London · KT6 5NE
Tel: 020 8545 9720
Email: contact@waterenvironment.co.uk
Web: www.waterenvironment.co.uk

CLIENT: Alton Town Council

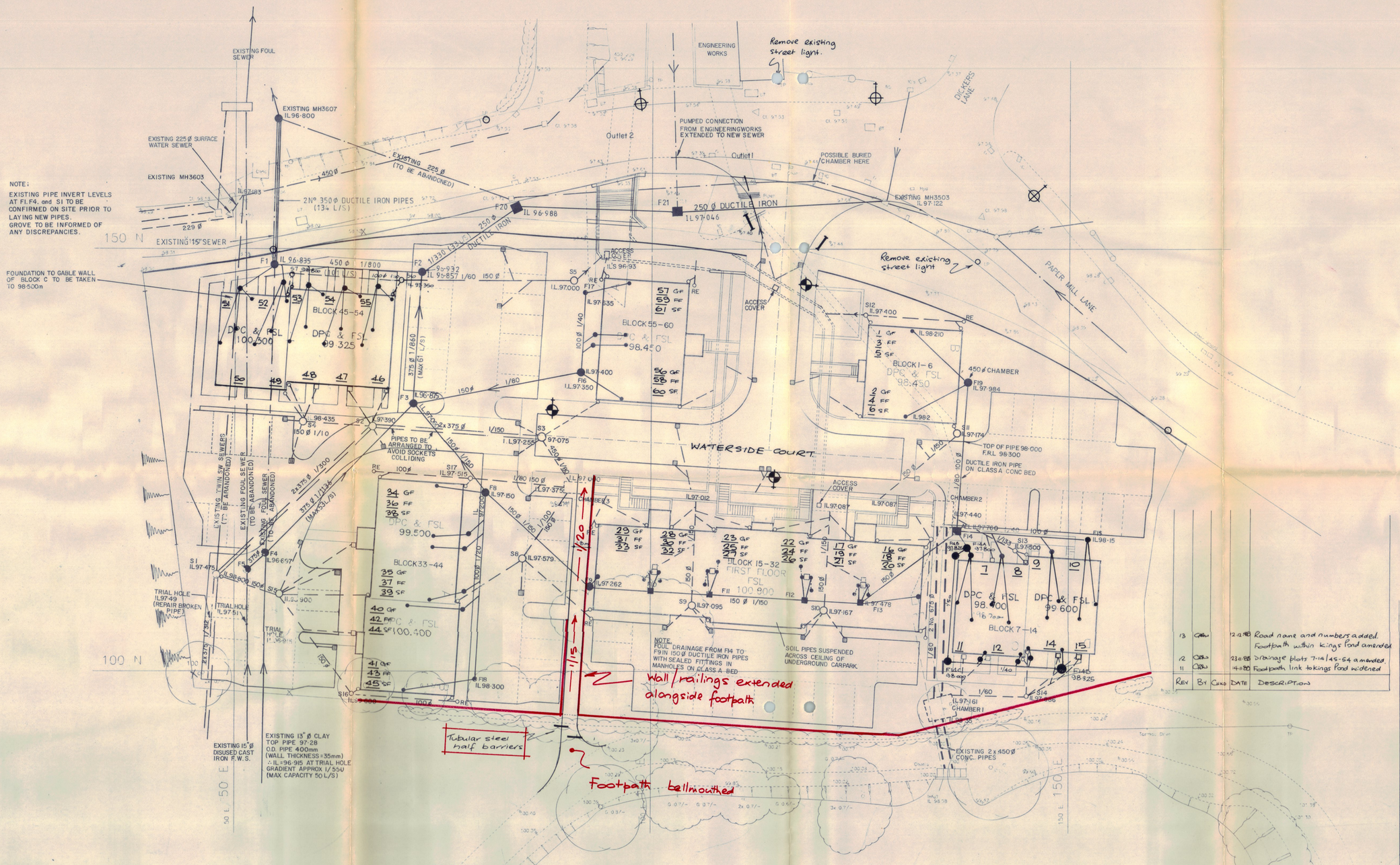
PROJECT: King's Pond

DRAWING: Feasibility Study Layout Option 3c

DRAWING NUMBER:	REVISION:
23109-EWK-SK-03	C01

SCALE @A1:	DATE:
1:500	09/02/2024

DRAWN BY:	CHECKED BY:	APPROVED BY:
GE	DM	GL



KEY.

- Existing foul sewer
- Proposed foul sewer
- Existing surface water sewer
- Proposed surface water sewer/drains

Surface. Foul.

- Brick chamber
- 1050 dia. PCC manhole (except manholes S1 to S3 and F1 to F5 to be 1350 dia. 450 dia. chamber
- Yard gully
- Road gully
- 6m lighting column
- 5m " "
- Existing " "

CO-ORDINATES OF CENTRES OF PRINCIPAL MANHOLES

F1	54.5E	148.3N
S1	47.8E	111.5N On extg sewer
F2	72.5E	147.5N
S2	66.6E	129.0N
F3	71.5E	131.7N
S3	86.8E	127.7N
F4	53.8E	114.0N On extg sewer
S4	58.3E	129.6N
F5	51.5E	112.2N On extg sewer
S5	90.6E	146.3N
F6	48.7E	131.9N
S6	70.0E	146.4N
S7	56.1E	146.4N
F8	80.0E	121.2N
S8	84.5E	113.5N
F9	92.5E	109.9N
S9	104.9E	107.7N
S10	120.7E	107.2N
S11	136.5E	128.2N
F13	125.1E	108.0N
F14	136.7E	123.7N
S15	55.5E	109.3N
F19	137.7E	134.2N

Other manholes positioned to suit building drainage as shown on plan.

Street name plate.

22 Postal address GF = Ground floor FF = First floor SF = Second floor.

All Building Drainage 100mm dia unless shown otherwise.
All Pipes Soffits level in Manholes unless shown otherwise.
Backdrops shown thus :- —●— OR —○—

REV	BY	CHKD	DATE	DESCRIPTION
10	GMW		23.3.89	Street lighting added.
9	G.B.	GR	17.5.89	Route F2 to 3607 changed
8		GR	22.2.89	MH F2 → MH 3607
7			7.11.88	Papermill Lane sewers & chamber 1
6	M.E.		2.11.88	PIPE ALTERATIONS 225ø TO 250ø
5	ME		3.10.88	MAJOR REVISIONS TO DRAINAGE
4	MD		4.10.88	Yard gullies added. M.H. Co-ords Added
3	MD		22.9.88	Yard gullies block C D & gullies to S6 omitted Redrawn
2				
13	GMW		12.2.90	Road name and numbers added. Footpath within kings Pond amended
12	GMW		23.1.90	Drainage plots 7-14/45-54 amended.
11	GMW		14.12.89	Footpath link to kings Pond widened

REV	BY	CHKD	DATE	DESCRIPTION

PROJECT: ALTON

TITLE: DRAINAGE LAYOUT

CLIENT: WIMPEY HOMES HOLDINGS

DESIGNED BY	CW	SCALE	1:250
SURVEYED BY			
CHECKED BY	G.D.R.	DATE	AUG.'88
ENGINEER	GDR		

GROVE CONSULTANTS LTD.

27 HAMMERSMITH GROVE LONDON W6 7EN TEL 01-846 1185 TELEX UK 25666 OVERSEAS 22436 FACS 01-748 0076

INFRASTRUCTURE & SURVEY DIVISION

CONTRACT	DRAWING	REV
H73 B 125	7201	13

MY 231240

Street nameplate specification

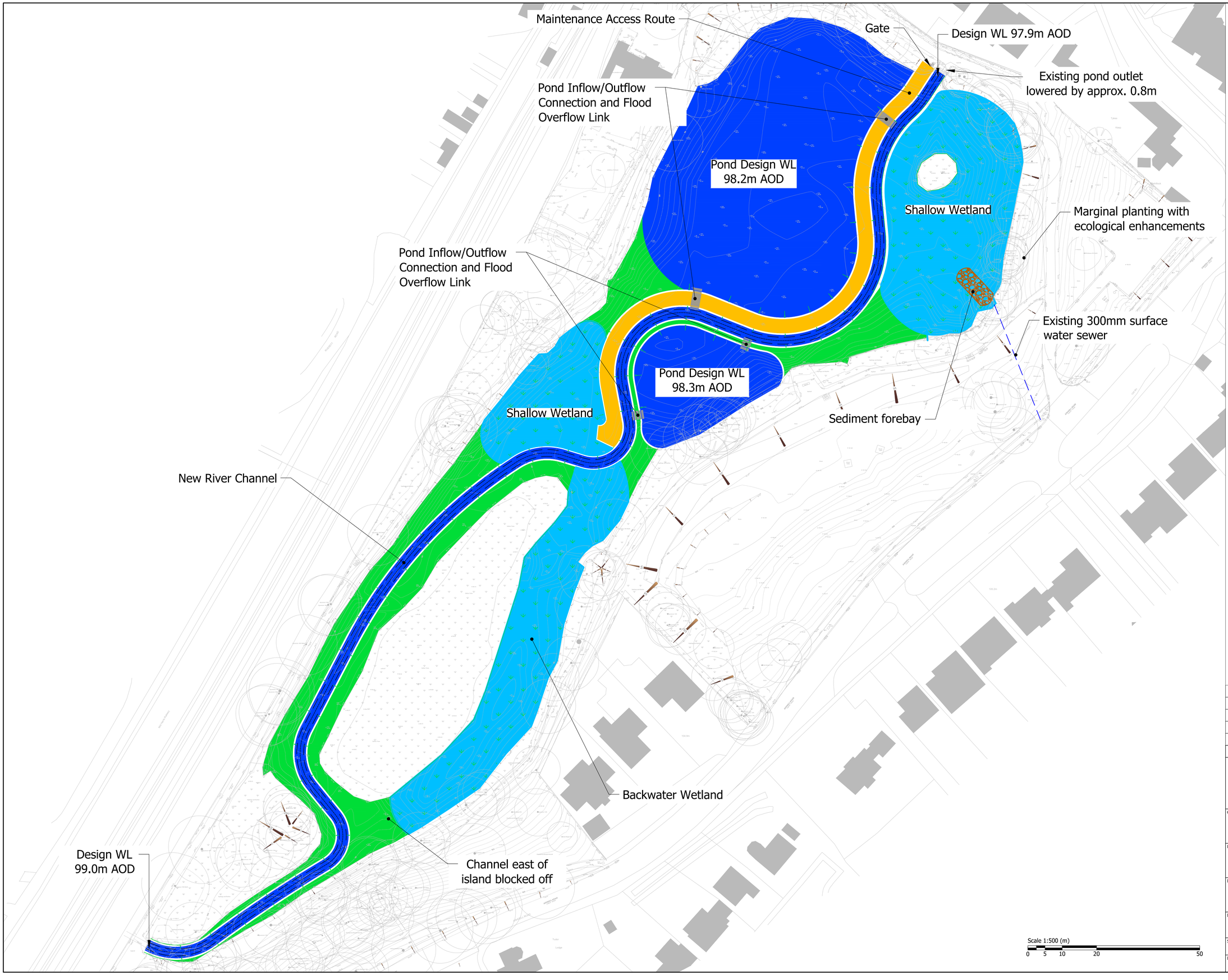
WATERSIDE COURT T

Manufactured by:-
Eastern Signs Limited
Tower Road
South Lowestoft Industrial Estate
Lowestoft
Suffolk NR33 7NA.

Die pressed stove enamelled aluminium with black 3½" kindersley lettering, ½" black border on white background, with integral 8161 no through road symbol, minimum 9" high. Nameplate to be riveted to zinc sprayed, grey painted 1½"x1½" x 3/16" steel frame, 5'0" overall height. Frame to be set 2'0" into ground.

Street light specification

- 36W Sox-E Side entry lantern with low loss integral gear controlled by a N.E.M.A. 1 part 100 lux P.E.C.U. on a 6 metre M.H. column with a 1·0m proj. bracket (Philips M136-GO*1)
- 26W Sox-E Side entry lantern with integral low loss gear controlled by a one part 100 lux P.E.C.U. mounted on a 5·0m M.H. column 0·5m proj. (Philips M126-GO*1)
- Existing lighting column to be retained.



NOTES

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2. To be read in conjunction with the Weir Removal Feasibility Study (ref. 23109-HMD-RP-01) by Water Environment.
3. Based on topographic survey undertaken by Rigour Survey in November 2023.
4. Any changes to ground and water levels are subject to detailed impact assessment.

N

PRELIMINARY

REV	DATE	AMENDMENTS	DRAW	APPR
C01	09.02.24	Final issue.	GE	GL

WATER | ENVIRONMENT
6 Coppergate Mews · Brighton Road · Surbiton · London · KT6 5NE
Tel: 020 8545 9720
Email: contact@waterenvironment.co.uk
Web: www.waterenvironment.co.uk

CLIENT: Alton Town Council

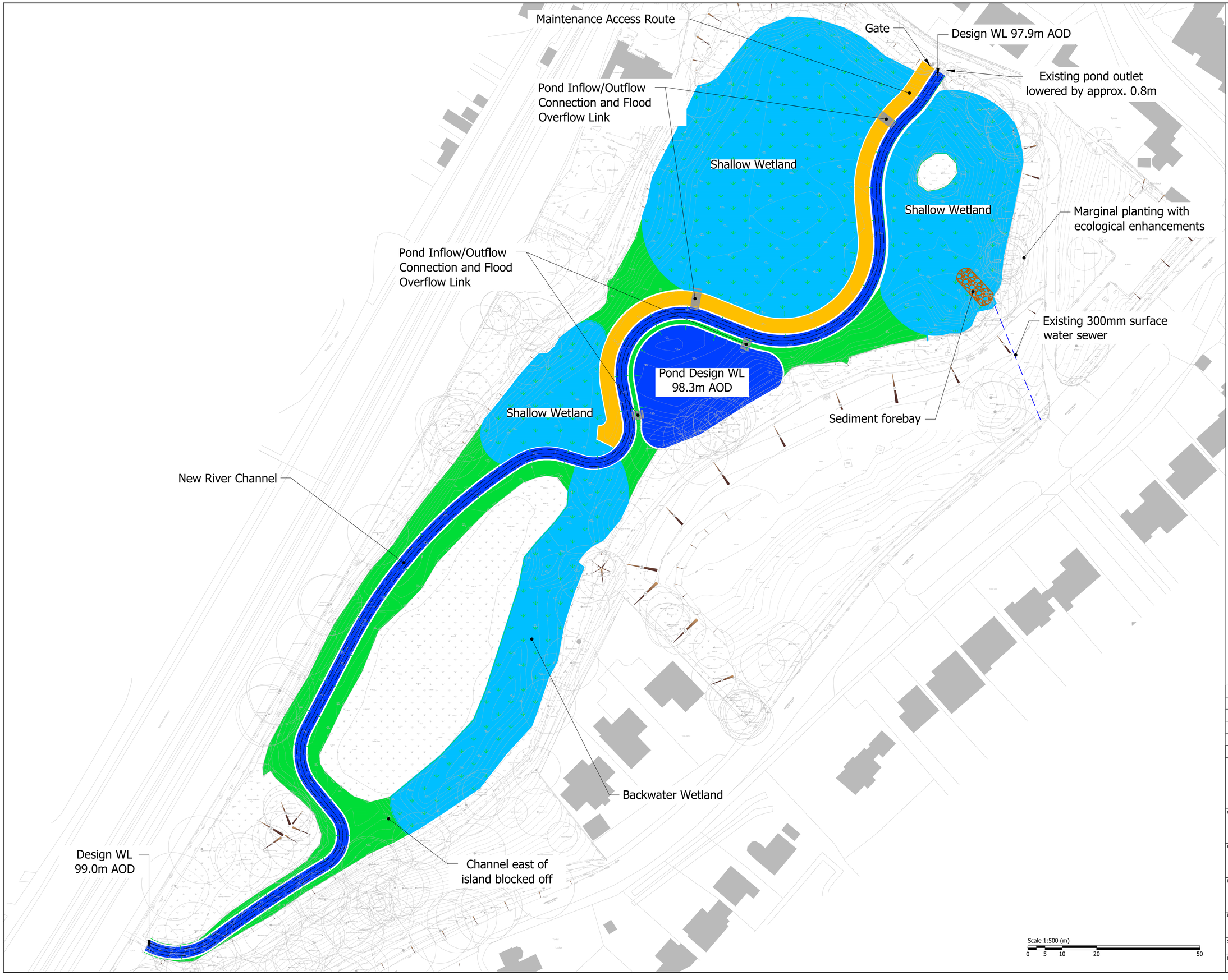
PROJECT: King's Pond

DRAWING: Feasibility Study Layout Option 4a

DRAWING NUMBER:	REVISION:
23109-EWK-SK-04	C01

SCALE @A1:	DATE:
1:500	09/02/2024

DRAWN BY:	CHECKED BY:	APPROVED BY:
GE	DM	GL



NOTES

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3. Based on topographic survey undertaken by Rigour Survey in November 2023.
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N

PRELIMINARY

REV	DATE	AMENDMENTS	DRAW	APPR
C01	09.02.24	Final issue.	GE	GL

WATER | ENVIRONMENT
6 Coppergate Mews · Brighton Road · Surbiton · London · KT6 5NE
Tel: 020 8545 9720
Email: contact@waterenvironment.co.uk
Web: www.waterenvironment.co.uk

CLIENT: Alton Town Council

PROJECT: King's Pond

DRAWING: Feasibility Study Layout Option 4b

DRAWING NUMBER:	REVISION:
23109-EWK-SK-05	C01

SCALE @A1:	DATE:
1:500	09/02/2024

DRAWN BY:	CHECKED BY:	APPROVED BY:
GE	DM	GL

APPENDIX B: TOPOGRAPHIC SURVEY

Rigour Survey. Geomatics Topographic Survey Ref: RS-2413. Phase Number 1. Revision 0. Status Final.

NORTH
Indicator

River Wey Outlet Culvert - Scale 1:100

ANNOTATIONS

DETAIL

AV	Air Valve
BH	Borehole
BO	Bollard
BS	Bus Stop
BU	Bush
BX	Box
CB	Control Box
CO	Column
DC	Drainage Channel
DP	Drain Pipe
DR	Drain
EM	Electric Transformer
EP	Electric Pole
ER	Earth Rod
FH	Fire Hydrant
FH	Flex Hydrant
FP	Flag Pole
FW	Foul Water
GG	Gully Grate
GU	Guy Wire
HVAC	Heating Ventilation Air Con
KO	Kerb Outlet
LP	Lamp Post
MK	Marker Post
MPO	Mooring Post
NB	Notice Board
NS	Name Board
OHL	Overhead Line
PB	Post Box
PM	Parking Meter
RA	Rain Gauge
RE	Rodding Eye
RS	Road Sign
SBP	Service Point
SC	Stop Cock
SI	Sign
SW	Surface Water
SY	Survey
SV	Sluice Valve
TC	Telecom Cover
TH	Trial Hole
TP	Traffic Light
TP	Telegraph Pole
TSC	Traffic Signal Cover
UC	Unknown Cover
UK	Unknown Tray
UTL	Unable To Lift
VP	Vent Pipe
WB	Waste Bin
WM	Water Meter
WO	Wash Out

FENCE & WALLS

ABF	Armco Barrier
BW	Brick Wall
BWF	Barbed Wire
CBW	Concrete Wall
CF	Corrugated Iron
CLF	Chain Link
CRF	Concrete Railing
GAR	Gabion Wall
IRF	Iron Railing
IWF	Interwoven Fence
OBF	Open Board Fence
PF	Post Fence
PCF	Post & Chain
PIF	Post & Iron Rail
PRF	Post & Rail
PWF	Post & Wire
RET	Retaining Wall
SPF	Steel Palisade
STW	Stone Wall
TW	Timber Wall
WMF	Wire Mesh Fence

LEVELS

AHL	Arch Head Level
ASL	Arch Spring Level
CL	Cill Level
CL	Ceiling Level
DPC	Damp Proof Course Level
DL	Door Level
DL	Decorative Cover Level
EL	Eaves Level
FL	Floor Level
FRL	Flat Roof Level
GL	Ground Floor Level
IL	Invert Level
MHL	Manhole Cover Level
RL	Ridge Level
THL	Threshold Level
TOB	Top of Beam Level
TOS	Top of Silt
TOW	Top of Wall Level
UBL	Underside of Beam Level
USB	Underside of Beam Level
WCL	Window Cill Level
WHL	Window Head Level
WL	Water Level

TREE SPECIES

HEDGE & SLOPES

Hedge Canopy Symbol

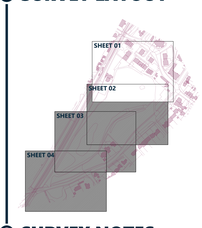
Gate Symbol

Slope Symbol

SURFACE HATCH

Ordnance Survey Data | Building & Structures | Vegetation & Scrub

SURVEY LAYOUT



SURVEY NOTES

The client must check and verify all geospatial data prior to commencing work.

Any errors or discrepancies must be notified to Rigour Survey immediately. The survey control stated is to be used for geomatic land & measured surveys at the stated scale.

Survey control must be checked and verified prior to use.

Dimensions are in metres & the plotting scale indicates the accuracy of the digital data.

Average canopy spreads & trunk diameters have been established for all trees. With descriptions and heights annotated. Please use these as a guide only.

Contours on steep banks have been removed for presentation purposes. These are represented using slope symbols.

Supplemented Ordnance Survey data is included for contextual and quality control principles. This data is presented on layer 0-OS-DATA.

© Rigour Survey hold the license & copyright to all geospatial data within this document and their written consent must be obtained before using the data other than for the purpose supplied.

Do not scale from this drawing.

ADDITIONAL COMMENTS:

The contours shown within the pond are inclusive of the hard bed. Contours within the pond for the top of silt levels are on a separate layer and have been turned off for presentation purposes.

The top of silt levels shown are an interpolated grid produced from a DTM calculated from using sonarmite ROV and GNSS readings

GRID & LEVEL

Ordnance Survey national grid coordinates & level have been determined for the network of survey control using global navigation satellite systems related to OSTN15(GB) and OSGM15(GB).

The survey grid is orientation is to grid north with a scale factor of 1.000.

SURVEY CONTROL

Control ID	Easting	Northing	Elevation	Description
RS01	472405.500	139459.843	100.429	Mag Nail
RS02	472384.000	139519.000	100.000	Mag Nail
RS03	472384.162	139579.302	99.760	Mag Nail
RS04	472338.896	139579.862	100.242	Mag Nail
RS05	472338.896	139579.862	100.242	Mag Nail
RS06	472199.654	139589.587	102.162	Mag Nail
RS07	472197.828	139542.237	101.258	Mag Nail
RS08	472198.225	139542.237	101.258	Mag Nail
RS09	472199.225	139579.246	99.971	Mag Nail
RS10	472211.606	139419.826	99.705	Mag Nail
RS11	472276.454	139581.581	100.178	Mag Nail
RS12	472276.454	139581.581	100.178	Mag Nail
RS13	472291.014	139542.440	100.172	Mag Nail
RS14	472291.014	139542.440	100.172	Mag Nail
RS15	472388.609	139587.329	100.526	Mag Nail

REVISION NOTES

ID Number	Comment	Initials	Date
0	First Issue	WDS	13/11/2023
A	Section positions added	WDS	01/12/2023

PROJECT DETAILS

ADDRESS
Kings Pond
Ashdell Road
Alton
GU34 2SZ

DELIVERABLE TYPE
Geomatics
Topographical Survey

CLIENT
Alton Town Council

ISSUE DATE
13/11/2023

DATA CAPTURE
WDS

DETAILED
CHP

APPROVED
WDS

SCALE
1:200

PROJECT NUMBER
RS-2413

PHASE NUMBER
1

REVISION
A

STATUS
Revised

Rigour SURVEY

NORTH
INDICATOR

ANNOTATIONS

DETAIL

AV	Air Valve
BH	Borehole
BO	Bollard
BS	Bus Stop
BU	Bush
BX	Box
CB	Control Box
CO	Column
DC	Drainage Channel
DP	Drain Pipe
DR	Drain
EM	Electric Transformer
EP	Electric Pole
ER	Earth Rod
FB	Flower Bed
FH	Fire Hydrant
FP	Flag Pole
FW	Foul Water
GG	Gully Grate
GU	Guy Wire
HVAC	Heating Ventilation Air Con
KO	Kerb Outlet
LP	Lamp Post
MK	Marker Post
MPO	Mooring Post
NB	Notice Board
NS	Name Board
OHL	Overhead Line
PB	Post Box
PM	Parking Meter
PO	Post
RE	Rodding Eye
RS	Road Sign
SC	Stopcock Post
SC	Stop Cock
SI	Sign
SW	Surface Water
SY	Survey
SV	Sluice Valve
TC	Telecom Cover
TH	Trial Hole
TP	Traffic Light
TP	Telegraph Pole
TSC	Traffic Signal Cover
UC	Unknown Cover
UK	Unknown Tree
UTL	Unable To Lift
VP	Vent Pipe
WB	Waste Bin
WM	Water Meter
WO	Wash Out

FENCE & WALLS

ABF	Armco Barrier
BW	Brick Wall
BWF	Barbed Wire
CBW	Concrete Wall
CF	Corrugated Iron
CLF	Chain Link
CR	Concrete Railing
GAR	Galvan Rail
IRF	Iron Railing
IWF	Interwoven Fence
OBF	Open Board Fence
PF	Picket
PCF	Post & Chain
PIF	Post & Iron Rail
PRF	Post & Rail
PWF	Post & Wire
RET	Retaining Wall
SPF	Steel Palisade
STW	Stone Wall
TWF	Trellis Wall
WMF	Wire Mesh Fence

LEVELS

ARL	Arch Head Level
ASL	Arch Spring Level
CL	Cill Level
CL	Ceiling Level
DPC	Damp Proof Course Level
DL	Door Level
DL	Door Interaction Cover Level
EL	Eaves Level
FL	Floor Level
FRL	Flat Roof Level
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IL	Invert Level
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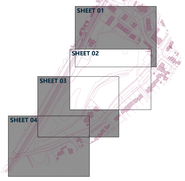
TOS	Top of Silt
TOW	Top of Wall Level
UBL	Underside of Beam Level
USB	Underside of Beam Level
WCL	Window Cill Level
WHL	Window Head Level
WL	Water Level

TREE SPECIES

HEDGE & SLOPES

SURFACE HATCH

SURVEY LAYOUT



SURVEY NOTES

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Supplemented Ordnance Survey data is included for contextual and quality control principles. This data is presented on layer P-OS-DATA.

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Do not scale from this drawing.

ADDITIONAL COMMENTS:

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The top of silt levels shown are an interpolated grid produced from a DTM calculated from using sonsemble RDV and GNSS readings

GRID & LEVEL

Ordnance Survey national grid coordinates & level have been determined for the network of survey control using global navigation satellite systems related to OSTN15(GB) and OSGM15(GB).

The survey grid is orientation is to grid north with a scale factor of 1.000.

SURVEY CONTROL

Control ID	Eastings	Northings	Elevation	Description
8501	472485.068	139483.842	103.459	Mag Nail
8502	472305.304	139485.725	101.816	Peg & Mag Nail
8504	472264.162	139379.062	100.182	Mag Nail
8505	472264.162	139379.062	100.182	Mag Nail
8506	472281.778	139388.875	101.043	Mag Nail
8508	472183.854	139288.897	102.182	Mag Nail
8509	472183.854	139288.897	102.182	Mag Nail
8508	472196.767	139322.295	100.897	Mag Nail
8509	472189.235	139376.846	99.971	Mag Nail
8510	472196.767	139322.295	100.897	Mag Nail
8511	472268.319	139483.318	100.172	Mag Nail
8512	472276.454	139487.901	100.170	Mag Nail
8513	472287.454	139492.460	100.172	Mag Nail
8514	472331.814	139543.442	100.177	Mag Nail
8515	472288.659	139567.629	100.236	Mag Nail

REVISION NOTES

ID Number	Comment	Initials	Date
0	First issue	WDS	13/11/2023
A	Section positions added	WDS	01/12/2023

PROJECT DETAILS

ADDRESS
Kings Pond
Ashdell Road
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GU34 2SZ

DELIVERABLE TYPE
Geomatics
Topographical Survey

CLIENT
Alton Town Council

ISSUE DATE
13/11/2023

DATA CAPTURE
WDS

DETAILED
CHP

APPROVED
WDS

SCALE
1:200

PROJECT NUMBER
RS-2413

PHASE NUMBER
1

REVISION
A

STATUS
Revised

Rigour SURVEY

NORTH
Indicative

ANNOTATIONS

DETAIL

AV	Air Valve
BH	Borehole
BO	Bollard
BS	Bus Stop
BU	Bush
BX	Box
CB	Control Box
CO	Column
DC	Drainage Channel
DP	Drain Pipe
DR	Drain
EP	Electric Transformer
EP	Electric Pole
ER	Earth Rod
FB	Flowerbed
FH	Fire Hydrant
FP	Flag Pole
FW	Foul Water
GG	Gully Grate
GP	Guard Post
HVAC	Heating Ventilation Air Con
KO	Kerb Outlet
LP	Lamp Post
MP	Marker Post
MPO	Mooring Post
NB	Notice Board
NS	Name Board
OHL	Overhead Line
PB	Post Box
PM	Parking Meter
RE	Reed Bed
RE	Rodding Eye
RS	Road Sign
SC	Soil Vent Pipe
SC	Stop Cock
SI	Sign
SW	Surface Water
SY	Syphon
SV	Sluice Valve
TC	Telecom Cover
TH	Trial Hole
TP	Test Pit Logs
TP	Telegraph Pole
TSC	Traffic Signal Cover
UC	Unknown Cover
UT	Unknown Tree
UTL	Unable To Lift
VP	Vent Pipe
WB	Waste Bin
WM	Water Meter
WO	Wash Out

FENCE & WALLS

ABF	Armco Barrier
BW	Brick Wall
BWF	Barbed Wire
CBW	Concrete Wall
CIF	Corrugated Iron
CLF	Chain Link
GAR	Galvanised Railing
GAS	Gabion Wall
IRF	Iron Railing
IWF	Interwoven Fence
OBF	Open Board Fence
PAL	Palisade
PCF	Post & Chain
PIF	Post & Iron Rail
PRF	Post & Rail
PWF	Post & Wire
RET	Retaining Wall
SPF	Steel Palisade
STW	Stone Wall
TIW	Timber Wall
WMF	Wire Mesh Fence

LEVELS

ARL	Arch Head Level
ASL	Arch Spring Level
CL	Cill Level
CL	Ceiling Level
DPC	Damp Proof Course Level
DL	Door Level
DL	Door Intersection Cover Level
EL	Eaves Level
FL	Floor Level
FRL	Flat Roof Level
GL	Ground Cover Level
IL	Invert Level
MHL	Manhole Cover Level
RL	Ridge Level
THL	Threshold Level
TOB	Top of Beam Level
TOS	Top of Silt
TOW	Top of Wall Level
UBL	Underside of Beam Level
USB	Underside of Beam Level
WCL	Window Cill Level
WHL	Window Head Level
WL	Water Level

TREE SPECIES

Saplings Bushes · Deciduous Trees · Trunk · Dead Trees · Coniferous Trees

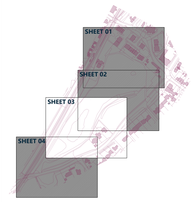
HEDGE & SLOPES

Hedge Canopy Symbol · Gate Symbol · Slope Symbol

SURFACE HATCH

Ordnance Survey Data · Building & Structures · Vegetation & Scrub

SURVEY LAYOUT



SURVEY NOTES

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Dimensions are in metres & the plotting scale indicates the accuracy of the digital data.

Average canopy spreads & trunk diameters have been established for all trees. With descriptions and heights annotated. Please use these as a guide only.

Contours on steep banks have been removed for presentation purposes. These are represented using slope symbols.

Supplemented Ordnance Survey data is included for contextual and quality control principles. This data is presented on layer P-OS-DATA.

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Do not scale from this drawing.

ADDITIONAL COMMENTS:

The contours shown within the pond are inclusive of the hard bed. Contours within the pond for the top of silt levels are on a separate layer and have been turned off for presentation purposes.

The top of silt levels shown are an interpolated grid produced from a DTM calculated from using sonsemble ROV and GNSS readings

GRID & LEVEL

Ordnance Survey national grid coordinates & level have been determined for the network of survey control using global navigation satellite systems related to OSTN15(GB) and OSGM15(GB).

The survey grid is orientation is to grid north with a scale factor of 1.000.

SURVEY CONTROL

Control ID	Easting	Northing	Elevation	Description
RS01	472405.569	139439.843	100.429	Mag Nail
RS02	472384.160	139400.000	101.886	Mag Nail
RS03	472384.162	139376.062	100.162	Mag Nail
RS04	472338.896	139318.862	100.191	Mag Nail
RS05	472338.896	139318.862	100.191	Mag Nail
RS06	472190.654	139308.587	102.162	Mag Nail
RS07	472187.658	139262.237	101.258	Mag Nail
RS08	472188.225	139262.237	101.258	Mag Nail
RS09	472189.225	139376.046	99.971	Mag Nail
RS10	472211.698	139419.838	99.795	Mag Nail
RS11	472276.454	139419.838	100.178	Mag Nail
RS12	472276.454	139381.381	100.178	Mag Nail
RS13	472281.210	139343.440	100.172	Mag Nail
RS14	472281.210	139343.440	100.172	Mag Nail
RS15	472388.609	139387.329	100.026	Mag Nail

REVISION NOTES

ID Number	Comment	Initials	Date
0	First Issue	WDS	13/11/2023
A	Section positions added	WDS	01/12/2023

PROJECT DETAILS

ADDRESS
Kings Pond
Ashdell Road
Alton
GU34 2SZ

DELIVERABLE TYPE
Geomatics
Topographical Survey

CLIENT
Alton Town Council

ISSUE DATE
13/11/2023

DATA CAPTURE
WDS

DETAILED
CHP

APPROVED
WDS

SCALE
1:200

PROJECT NUMBER
RS-2413

PHASE NUMBER
1

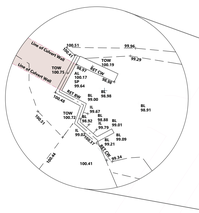
REVISION
A

STATUS
Revised

Rigour SURVEY

NORTH
INDICATOR

River Wey Inlet Culvert - Scale 1:100



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MK	Marker Post
MPO	Mooring Post
NB	Notice Board
NB	Name Board
OHL	Overhead Line
PB	Post Box
PM	Parking Meter
RE	Reading
RE	Rodding Eye
RS	Road Sign
SBV	Stopping Valve
SC	Stop Cock
SI	Sign
SW	Surface Water
SY	Sump
SV	Sluice Valve
TC	Telecom Cover
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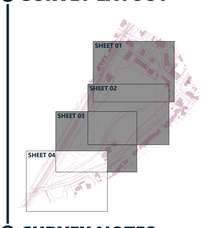

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RS05	472317.814	139338.281	100.182	Mag Nail
RS06	472190.654	139408.587	100.182	Mag Nail
RS07	472187.658	139242.237	101.258	Mag Nail
RS08	472188.225	139242.237	101.258	Mag Nail
RS09	472189.225	139378.246	99.971	Mag Nail
RS10	472277.899	139418.828	99.795	Mag Nail
RS11	472276.408	139418.828	99.795	Mag Nail
RS12	472278.454	139481.901	100.174	Mag Nail
RS13	472277.214	139543.440	100.172	Mag Nail
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SCALE
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PROJECT NUMBER
RS-2413

PHASE NUMBER
1

REVISION
A

STATUS
Revised

Rigour SURVEY

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APPENDIX C: GROUND INVESTIGATION

Ground&Water Contamination Assessment Report. Ref: GWPR5623/CAR

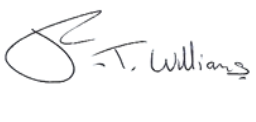
geotechnical and environmental consultants

ground&water

Contamination Assessment Report

Kings Pond, Alton, Hampshire, GU34 2SZ

On behalf of Alton Town Council

Report Reference: GWPR5623/CAR/October 2022			Status: Final
Issue	Prepared By	Checked By	Verified By
v.1.01			
	Aubyn Shortland BSc (Hons) FGS Senior Engineer	Miltiadis Mellios MSc(Eng) GMICE FGS MIEnvSc Principal Engineer	Francis Williams MGeol (Hons) FGS CEnv CGeol Director

Site Investigations | Environmental Consultants | Geotechnical Engineers

2 The Long Barn, Norton Farm, Selborne Road, Alton, Hampshire GU34 3NB
0333 600 1221 enquiries@groundandwater.co.uk **groundandwater.co.uk**

Registered Office: Kineton House, 31 Horse Fair, Banbury, Oxfordshire OX16 0AE Registered in England No. 07032001

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EXECUTIVE SUMMARY	
PROPOSED DEVELOPMENT	At the time of reporting, November 2023, it was understood that the proposed development comprised dredging works of the underlying soil beneath the pond waters.
GEOLOGY AND HYDROGEOLOGY	The British Geological Survey Solid and Drift Geology Map for the Alton area (Alresford Sheet No.300) revealed that the site was underlain by superficial Alluvial and River Terrace Deposits underlain by bedrock deposits of the Zig-Zag Chalk Formation. An area of Made Ground (Undivided) was noted within the sites boundary however formed an area to the south, not beneath the water feature. It was understood this Made Ground (Undivided) were deposits placed on-site from previous dredging works. The DEFRA online maps indicated that the site was located on a Secondary (A) Aquifer associated with the superficial River Terrace Deposits underlain by a Principal Aquifer comprising the Zig-Zag Chalk Formation. Examination of the Environment Agency records showed that the site fell within a Environment Agency Flood Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year.
CONTAMINATION	Asbestos Asbestos was identified within one sample (TP05/0.50m) as "Small ACM fragment typical of an asbestos – Amosite". A Quantification was undertaken on the sample and indicated that asbestos was present at <0.001%. Benzo(a)pyrene Elevated levels of Benzo(a)pyrene were noted within the samples collected at TP03/1.20m bwl and TP05/0.50m bwl. Benzo(b)fluoranthene Elevated levels of Benzo(b)fluoranthene were noted within the samples collected at TP03/1.20m bwl and TP05/0.50m bwl. Dibenzo(a,h)anthracene Elevated levels of Dibenzo(a,h)anthracene were noted within the sample collected at TP03/1.20m bwl. Benzo(b)fluoranthene Elevated levels of Benzo(b)fluoranthene was noted within the surface water sample collected at the exit point of the feature. Benzo(k)fluoranthene Elevated levels of Benzo(k)fluoranthene was noted within the surface water sample collected at the exit point of the feature. Fluoranthene Elevated levels of Benzo(k)fluoranthene was noted within the surface water samples collected at the entrance and exit points of the feature.

1. INTRODUCTION

1.1. General

Ground and Water Limited were instructed by Alton Town Council on the 28th September 2023 to conduct a Contamination Assessment Report on the site at Kings Pond, Alton, Hampshire, GU34 2SZ. The scope of the investigation was detailed within the fee proposal GW-2365, dated the 25th September 2023.

1.2. Aims of the Investigation

The aim of this report was to supply the client and their designers with information regarding any potential contamination of the soils beneath the pond and the quality of the surface water entering/exiting the feature.

The techniques adopted for the investigation were chosen considering the requirements of the client, anticipated ground conditions, and bearing in mind the nature of the site, limitations to site access and other logistical limitations.

1.3. Conditions and Limitations

This report has been prepared based on the terms, conditions and limitations outlined within Appendix A.

1.4. Technical Glossary

Generic technical terms and their description can be viewed within the glossary provided within Appendix B.

2. SITE SETTING

2.1. Site Location

The site comprised a ~19,272m^2 irregular-shaped plot of land, orientated in a north-east to south-west direction, along the north-western side of Ashdell Road. The site was located within the central portion of Alton, East Hampshire.

The national grid reference for the centre of the site was approximately SU 72292 39466. A site location plan is given within Figure 1.

2.2. Site Description

At the time of site works, October 2022, the site comprised the Kings Pond feature that formed the majority of the site. Surrounding the pond on all boundary sides was associated areas of open grassland that also contained a circular tarmac walkway. A car park area was located to the north-east extent of the site.

2.3. Proposed Development

At the time of reporting, November 2023, it was understood that the proposed development comprised dredging works of the underlying soil beneath the pond waters.

2.4. Geology

The British Geological Survey Solid and Drift Geology Map for the Alton area (Alresford Sheet No.300) revealed that the site was underlain by superficial Alluvial and River Terrace Deposits underlain by bedrock deposits of the Zig-Zag Chalk Formation. An area of Made Ground (Undivided) was noted within the sites boundary however formed an area to the south, not beneath the water feature. It was understood this Made Ground (Undivided) were deposits placed on-site from previous dredging works.

2.5. Hydrogeology and Hydrology

The DEFRA online maps indicated that the site was located on a Secondary (A) Aquifer associated with the superficial River Terrace Deposits underlain by a Principal Aquifer comprising the Zig-Zag Chalk Formation.

Examination of the Environment Agency records showed that the site fell within a Environment Agency Flood Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year.

3. SITE WORKS

3.1. Scope of Works

Site works were undertaken on the 6th November 2023 and comprised the recovery of soil samples from the underlying pond bed from five different locations (TP01 – TP05) across the pond. Two surface water samples were also collected from the entrance and exit of the water feature.

The location of the trial hole locations can be seen within Figure 3.

3.2. Sampling Procedures

A selection of samples were despatched to a laboratory for chemical testing purposes.

4. ENCOUNTERED GROUND CONDITIONS

4.1. Soil Conditions

The trial holes were logged by a Ground and Water Limited representative, generally in accordance with BS EN 14688 'Geotechnical Investigation and Testing – Identification and Classification of Soil'.

The ground conditions encountered within the trial holes constructed on the site did generally conform to that anticipated from examination of the geology map. Alluvial deposits were noted for the whole depth of the trial pits.

The succession of conditions and description of soils encountered in the trial holes in descending order is tabulated below.

Summary of Strata Encountered (BH01 – BH02)			
Strata	**Top Depth (m bwl)**	**Base Depth (m bwl)**	**Thickness (m)**
ALLUVIUM: Black to dark brown SILT with frequent organic detritus.	0.40 – 1.10	0.50 – 1.20	0.10

A trial hole location plan can also be viewed within Figure 3.

4.2. Obstructions

No artificial or natural sub-surface obstructions were noted during construction of the trial holes.

5. CONTAMINATION RISK ASSESSMENT

Chemical laboratory testing, scheduled by Ground and Water Limited, and carried out by ALS Laboratories UK Limited, was undertaken on five samples of the Alluvium. The samples were subjected to a combination of analysis that comprised:

- Asbestos screen;
- Semi-metals and heavy metals incl. Arsenic, Cadmium, Chromium (incl. Hexavalent Chromium), Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc;
- Polycyclic Aromatic Hydrocarbons (PAH's) incl. Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene;
- Speciated TPH including full aliphatic/aromatic split; and
- BTEX compounds (Benzene, Toluene, Ethylbenzene, Xylene) and MTBE – used as marker compounds for Volatile Organic Compounds (VOCs).

A breakdown of the number of tests undertaken for each determinand is discussed in further sections. The chemical laboratory results are presented in Appendix C.

5.1.1. Soil Assessment Criteria and Results

At the time of reporting, November 2023, it was understood that the proposed development comprised dredging works of the underlying soil beneath the pond waters.

Based on the proposed development, the results of the chemical laboratory testing were compared to the Generic Assessment Criteria (GAC) for a ***"Public Open Space: Residential"*** land-use scenario, as this was considered the most appropriate land-use scenario.

Where a contaminant of concern's GAC varies according to the Soil's Organic Matter (SOM), the SOM recorded for each uncontaminated soil type was used to derive the appropriate GAC for each soil type. A SOM value of 1%, the most conservative value, was utilised.

A summary of the analytical results and the comparison to the determinands adopted screening value are presented in the table below and overleaf.

Soil Contamination Test Results and Screening Values					
Determinand	**Number of Samples**	**Minimum Concentration (mg/kg)**	**Maximum Concentration (mg/kg)**	**Adopted Screening Value (mg/kg)**	**Was the adopted screening value exceeded for relevant land-use scenario?**
INORGANICS					
Asbestos	5	ND	Detected	ND	Yes – See Below
Cyanide (total)	5	<1	<1	24	No
Phenols	5	<0.035	<0.035	760	No
METALS					
Arsenic	5	4.03	7.91	79	No
Boron	5	<1	1.47	21000	No
Cadmium	5	0.556	1.32	120	No
Chromium (III)	5	17.2	32	1500	No
Chromium (Hexavalent)	5	<0.6	<0.6	8	No
Copper	5	47.9	88.2	12000	No
Lead	5	165	446	630	No
Mercury	5	0.151	0.83	16	No
Nickel	5	11.1	19.4	230	No
Selenium	5	2.37	2.93	1100	No
Vanadium	5	15.5	25.8	2000	No
Zinc	5	325	705	81000	No
TOTAL PETROLEUM HYDROCARBONS (TPHs)					
Aliphatic >C5 - C6	2	<0.01	<0.01	570000	No
Aliphatic >C6 - C8	2	<0.01	<0.01	600000	No
Aliphatic >C8 - C10	2	<0.01	<0.01	13000	No
Aliphatic >C10 - C12	2	<1	<1	13000	No
Aliphatic >C12 - C16	2	<1	2.21	13000	No
Aliphatic >C16 - C21	2	31.3	75.2	250000	No
Aliphatic >C21 - C35	2	207	254		
Aliphatic >C35 – C44	2	33.8	37.6	250000	No
Aromatic >C5 - C7	2	<0.01	<0.01	56000	No
Aromatic >C7 - C8	2	<0.01	<0.01	56000	No
Aromatic >C8 - C10	2	<0.01	<0.01	5000	No
Aromatic >C10 - C12	2	<1	<1	5000	No
Aromatic >C12 - C16	2	<1	1.21	5100	No
Aromatic >C16 - C21	2	20.6	41.7	3800	No
Aromatic >C21 - C35	2	298	385	3800	No
Benzene	2	<0.02	<0.02	72	No
Toluene	2	<0.02	<0.02	56000	No
Ethylbenzene	2	<0.02	<0.02	24000	No
m,p-Xylene	2	<0.04	<0.04	41000	No
o-Xylene	2	<0.04	<0.04	41000	No
POLYCYCLIC-AROMATIC HYDROCARBONS					
Acenapthene	2	<0.08	0.392	15000	No
Acenapthylene	2	<0.12	0.906	15000	No
Anthracene	2	<0.16	1.72	74000	No
Benzo(a)anthracene	2	2.92	9.27	29	No
Benzo(a)pyrene	2	4.47	14.1	5.7	Yes – See Below
Benzo(b)fluoranthene	2	5.08	16.3	7.1	Yes – See Below
Benzo(ghi)perylene	2	3.69	10.5	640	No

Soil Contamination Test Results and Screening Values					
Determinand	**Number of Samples**	**Minimum Concentration (mg/kg)**	**Maximum Concentration (mg/kg)**	**Adopted Screening Value (mg/kg)**	**Was the adopted screening value exceeded for relevant land-use scenario?**
Benzo(k)fluoranthene	2	2.2	6.23	190	No
Chrysene	2	3.44	9.63	57	No
Dibenzo(a,h)anthracene	2	<0.23	1.73	0.57	Yes – See Below
Fluoranthene	2	4.98	17.9	3100	No
Fluorene	2	<0.1	0.457	9900	No
Indeno(1,2,3-cd)pyrene	2	3.09	8.89	82	No
Naphthalene	2	<0.09	<0.09	4900	No
Phenanthrene	2	1.19	4.33	3100	No
Pyrene	2	4.39	15.5	7400	No
MARKER FOR VOLATILE ORGANIC COMPOUND					
Methyl tert-butyl ether (MTBE)	2	<0.01	<0.01	73	No
The derivation of the Soil Assessment Criteria used within this report can be seen within Appendix D. The soil concentrations were typically compared to the LQM/CIEH Suitable for Use Levels (S4UL) (2014), based upon the assumption of 1% soil organic matter. A screening value for Lead is based on the Category 4 Screening Levels (C4SLs). Where no S4UL or C4SL is available for Cyanide, a SoBRA acute GAC is assigned. Where no S4UL or C4SL is available for MTBE, a CL:AIRE 2010 GAC is assigned. Where exceedances are noted, the trial hole and depth of sample is recorded.					

It should be noted that the end use of the material was not understood to be redeposited on-site and therefore the GAC used should be interpreted as an indicator for the means of comparison rather than a direct assessment. The material should be removed from site under a suitable Material Management Plan (MMP).

5.1.2. Soil Assessment

The comparison between the laboratory analysis and the assessment criteria indicates that there is an unacceptable risk to future receptors caused by exceedances of the following determinands: Asbestos, Benzo(a)pyrene, Benzo(b)fluoranthene and Dibenzo(a,h)anthracene.

Asbestos

Asbestos was identified within one sample (TP05/0.50m) as “Small ACM fragment typical of an asbestos – Amosite”. A Quantification was undertaken on the sample and indicated that asbestos was present at <0.001%.

An **Asbestos Management Strategy** should be put in place so that any potentially asbestos containing materials are identified and removed from site in a suitable manner to prevent cross-contamination.

It is recommended further sampling is undertaken within the vicinity of TP05 to increase the dataset and provide further samples for delineation of the asbestos containing material.

Benzo(a)pyrene

Elevated levels of Benzo(a)pyrene were noted within the samples collected at TP03/1.20m bwl and TP05/0.50m bwl.

Benzo(b)fluoranthene

Elevated levels of Benzo(b)fluoranthene were noted within the samples collected at TP03/1.20m bwl and TP05/0.50m bwl.

Dibenzo(a,h)anthracene

Elevated levels of Dibenzo(a,h)anthracene were noted within the sample collected at TP03/1.20m bwl.

5.2. Groundwater Risk Assessment

Surface water sampling of the entrance and exit points of the pond were recovered to provide an assessment of the general water quality. It was determined that the most applicable screening values to be used is the Environmental Quality Standards (EQS), which are protective of ecology within the water. Where no EQS is available, other water quality standards have been noted within the table. This assessment compares the recorded concentration of a determinand to a pre-defined GAC (EQS, USEPA and UK drinking water standard).

The chemical laboratory results are presented in Appendix C and have been summarised within the table below and overleaf. Only determinands that have an appropriate screening value have been included within the table.

Groundwater Contamination Test Results and Screening Values				
Determinand	**Entrance Sample Concentration (µg/l)**	**Exit Sample Concentration (µg/l)**	**Adopted Screening Value (µg/l)**	**Was the adopted screening value exceeded?**
INORGANICS				
pH	8.09	8.36	6.5 – 9.5[5]	No
Cyanide	< 50	< 50	1[1]	No
Phenols	<50	<50	7.7[8]	No
METALS				
Arsenic	0.539	0.515	50[1]	No
Boron	24.1	31.7	750[1]	No
Cadmium	<0.08	<0.08	0.08 – 0.25[1,2]	No
Chromium (III)	<1	<1	4.7[1]	No
Chromium (Hexavalent)	< 30	< 30	3.4[8]	No
Copper	0.425	0.304	1[1]	No
Lead	0.411	0.262	1.2[1]	No
Mercury	< 0.01	< 0.01	0.07[1]	No
Nickel	0.46	0.53	4[1]	No
Selenium	<1	<1	7.5[1]	No
Vanadium	<1	<1	86[6]	No
Zinc	2.66	8.17	10.9[1]	No
PETROLEUM HYDROCARBONS				
Aliphatic >C5 – C6	<10	<10	15,000[3]	No
Aliphatic >C6 – C8	<10	<10		No
Aliphatic >C8 – C10	<10	<10	300[3]	No
Aliphatic >C10 – C12	<10	<10		No
Aliphatic >C12 – C16	<10	<10		No
Aliphatic >C16 – C21	<10	<10	Not derived	No
Aliphatic >C21 – C35	<10	<10	Not derived	No
Aromatic >EC5 – EC7	<10	<10	10[3]	No

Groundwater Contamination Test Results and Screening Values				
Determinand	**Entrance Sample Concentration (µg/l)**	**Exit Sample Concentration (µg/l)**	**Adopted Screening Value (µg/l)**	**Was the adopted screening value exceeded?**
Aromatic >EC7 – EC8	<10	<10	700[3]	No
Aromatic >EC8 – EC10	<10	<10	300[3]	No
Aromatic >EC10 – EC12	<10	<10	90[3]	No
Aromatic >EC12 – EC16	<10	<10		No
Aromatic >EC16 – EC21	<10	<10	90[3]	No
Aromatic >EC21 – EC35	<10	<10		No
Total TPH	<10	<10	10[51]	No
Benzene	< 1	< 1	10[1]	No
Toluene	< 1	<1	74[1]	No
Ethylbenzene	< 1	< 1	300[3]	No
Xylene	< 1	< 1	15.5-63.6[1]	No
POLYCYCLIC-AROMATIC HYDROCARBONS				
Anthracene	<0.005	<0.005	0.1[1]	No
Benzo(a)pyrene	<0.002	<0.002	0.00017[1]	No
Benzo(b)fluoranthene	<0.005	0.0275	[7]	Yes
Benzo(k)fluoranthene	<0.005	0.0083		Yes
Benzo(ghi)perylene	<0.005	<0.005	[7,8]	No
Dibenzo(a,h)anthracene	<0.005	<0.005	0.0025[6,8]	No
Fluoranthene	0.0218	0.047	0.0063[1]	Yes
Fluorene	<0.005	<0.005	290[6]	No
Indeno(1,2,3-cd)pyrene	<0.005	<0.005	[7,8]	No
Naphthalene	<0.01	<0.01	2[1]	No
Total EPA-16 PAHs	<0.082	0.134	0.1[5]	Yes
VOLATILE ORGANIC COMPOUND				
Total VOCs	<0.1	<0.1	-	No

[1]Environmental Quality Standards (EQS)
[2]Screening value changes as a result of calcium carbonate concentration of aquifer
[3]WHO Guidelines for drinking water quality, 2022
[4]Site specific threshold calculated based on the bio-availability per sample
[5]UK Drinking Water Standards
[6]United States Environmental Protection Agency
[7]For the group of priority substances for PAH, the AA EQS in water refer to the concentration of Benzo(a)pyrene on the toxicity of which they are based. Benzo(a)pyrene can be considered as a marker for other PAH's, hence only Benzo(a)pyrene must be monitored for comparison with the AA EQS.
[8]Maximum concentration was level of detection which was the above the screening value.

Benzo(b)fluoranthene

Elevated levels of Benzo(b)fluoranthene was noted within the surface water sample collected at the exit point of the feature.

Benzo(k)fluoranthene

Elevated levels of Benzo(k)fluoranthene was noted within the surface water sample collected at the exit point of the feature.

Fluoranthene

Elevated levels of Benzo(k)fluoranthene was noted within the surface water samples collected at the entrance and exit points of the feature.

5.3. Waste Disposal

The excavation soils is likely to produce waste which will require classification and then recycling or removal from site.

Under the Landfill (England and Wales) Regulations 2002 (as amended), prior to disposal, all waste must be classified as either: Inert; Non-hazardous; or Hazardous.

The Environment Agency's Hazardous Waste Technical Guidance (WM3) document outlines the methodology for classifying wastes. Once classified the waste can be removed to the appropriately licensed facilities, with some waste requiring pre-treatments prior to disposal.

Following the investigation, 5No. samples were submitted to the analytical laboratory to undergo a suite of testing for contamination testing, as discussed in the previous sections. Sampling depths were chosen to reflect the receptor of concern, human health, and typically comprised a surface or near surface sample and periodically to 1.00m bgl. Any horizon where olfactory or visual evidence of contamination was present was also sampled.

Based on a risk phase analysis of the chemical laboratory test results, in accordance with EC Hazardous Waste Directive and undertaken by Ground and Water Limited, all soil samples tested on-site were NON-HAZARDOUS. The results of the assessment are given within Appendix E.

Soils containing asbestos are considered HAZARDOUS if the level of asbestos in the Made Ground is above the threshold of 0.1% or visual fragments can be observed. As quantification of the asbestos in the sample recovered from TP05/0.50m bgl was <0.001% (less than 0.1%) the Made Ground with asbestos detected in was NON-HAZARDOUS with respect to waste classification.

It is important to note that whilst we consider our in-house assessment tool to be an accurate interpretation of the requirements of WM3, therefore producing an initial classification in accordance with the guidance, this method classifies soils as either non-hazardous or hazardous and landfill operators have their own assessment tools and can often come to different conclusions. As a result, some landfill operators could refuse to take apparently suitable waste. It is recommended that the receiving landfill views the results of this assessment and the chemical laboratory results to determine their own classification.

In addition to the samples described above, 1No. sample was scheduled to undergo Waste Acceptance Criteria (WAC) testing with single batch leachate from samples with a range of depths. The sample results were not available at the time of reporting and will provided as a revision to this report.

It should be noted that the receiving landfill may see the presence of Made Ground within the soils to be indicative of a non-hazardous classification despite the presence of the WAC testing certificates indicating that it is inert. Therefore, it should be considered that all Made Ground is classified as Non-hazardous, subject to finalising with the receiving landfill.

Where contaminated soils are to be removed, they should be placed on an impermeable membrane (visqueen or similar) to ensure that no cross-contamination of soils occurs.

5.4. Duty of Care

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

To prevent exposure to airborne dust by both the general public and construction personnel the site should be kept damp during dry weather and at other times when dust would be generated as a result of construction activities.

The site should be securely fenced at all times to prevent unauthorised access. Washing facilities should be provided and eating restricted to mess huts.

FIGURES

2 The Long Barn, Norton Farm, Selborne Road, Alton, Hampshire GU34 3NB
0333 600 1221 enquiries@groundandwater.co.uk **groundandwater.co.uk**

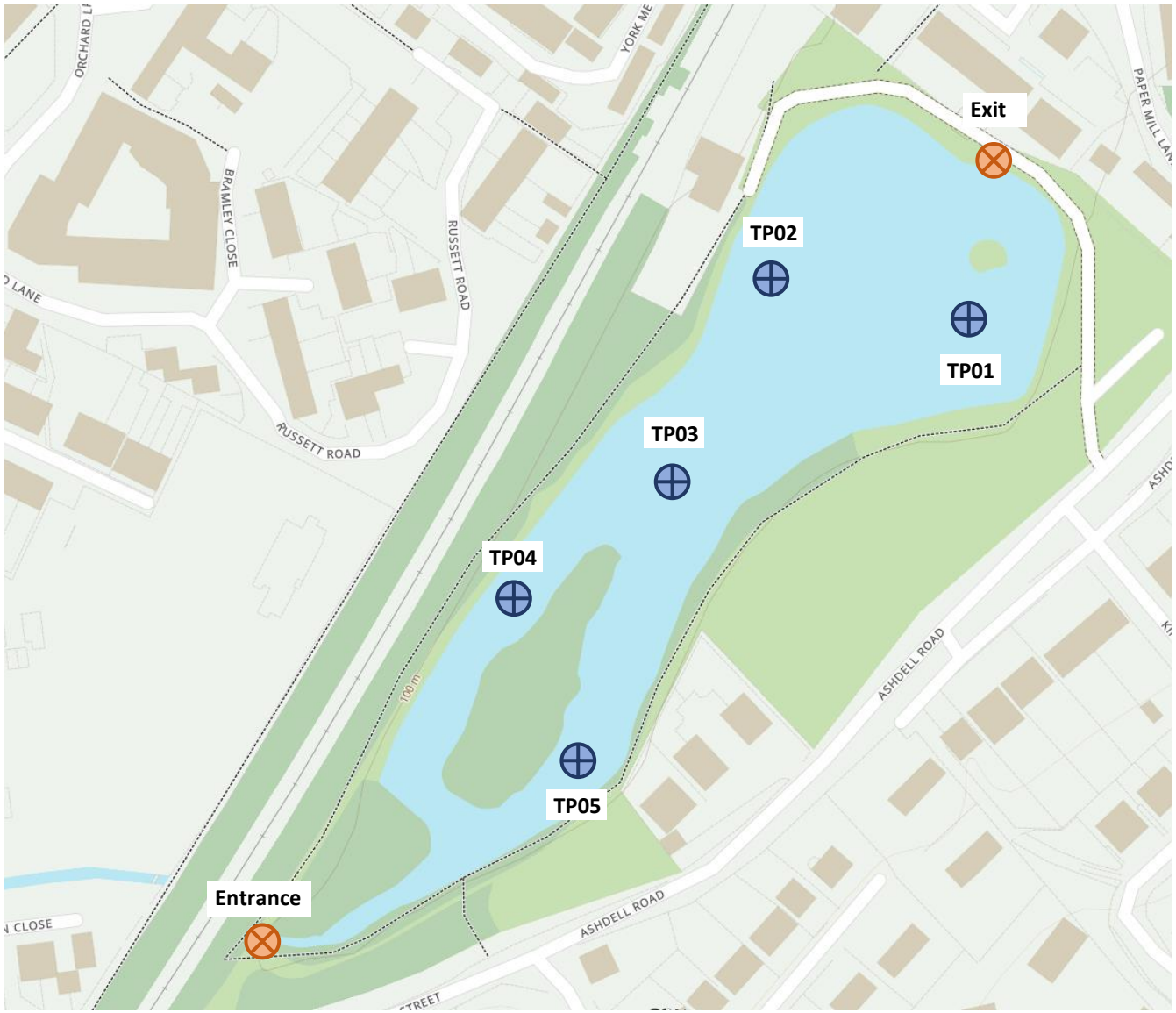
Registered Office: Kineton House, 31 Horse Fair, Banbury, Oxfordshire OX16 0AE Registered in England No. 07032001

Site boundary

Approximately 30m

Kings Pond, Alton, Hampshire	
Alton Town Council	**November 2022**
Figure 1 – Site Location Plan	**GWPR5623**

ground&water



Surface Water Samples

Silt Bed Sample

Approximately 30m

Kings Pond, Alton, Hampshire	
Alton Town Council	**November 2022**
Figure 2 – Trial Hole Location Plan	**GWPR5623**

ground&water

APPENDIX A: Conditions and Limitations

2 The Long Barn, Norton Farm, Selborne Road, Alton, Hampshire GU34 3NB
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The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The report has been prepared on the basis of information, data and materials which were available at the time of writing. Accordingly, any conclusions, opinions or judgements made in the report should not be regarded as definitive or relied upon to the exclusion of other information, opinions and judgements.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief; as such these do not necessarily address all aspects of ground behaviour at the site. No liability is accepted for any reliance placed on it by others unless specifically agreed in writing.

Any decisions made by you, or by any organisation, agency or person who has read, received or been provided with information contained in the report ("you" or "the Recipient") are decisions of the Recipient and we will not make, or be deemed to make, any decisions on behalf of any Recipient. We will not be liable for the consequences of any such decisions.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

Any Recipient must take into account any other factors apart from the Report of which they and their experts and advisers are or should be aware. The information, data, conclusions, opinions and judgements set out in the report may relate to certain contexts and may not be suitable in other contexts. It is your responsibility to ensure that you do not use the information we provide in the wrong context.

This report is based on readily available geological records, the recorded physical investigation, the strata observed in the works, together with the results of completed site and laboratory tests. Whilst skill and care has been taken to interpret these conditions likely between or below investigation points, the possibility of other characteristics not revealed cannot be discounted, for which no liability can be accepted. The impact of our assessment on other aspects of the development required evaluation by other involved parties.

The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous in ground activities. The ground conditions have been sampled or monitored in recorded locations and tests for some of the more common chemicals generally expected. Other concentrations of types of chemicals may exist.

The conclusions and recommendations relate to Kings Pond, Alton, Hampshire, GU34 2SZ.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sampler borehole implies the specific technique used to produce a trial hole.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot-by-plot basis prior to the construction of foundations. Where trees are mentioned in the text this means existing trees, recently removed trees (approximately 15 years to full recovery on cohesive soils) and those planned as part of the site landscaping.

Ownership of copyright of all printed material including reports, laboratory test results, trial pit and borehole log sheets, including drillers log sheets, remain with Ground and Water Limited. Licence is for the sole use of the client and may not be assigned, transferred or given to a third party.

Only our client may rely on this report and should this report or any information contained in it be provided to any third party we accept no responsibility to the third party for the contents of this report save to the extent expressly outlined by us in writing in a reliance letter addressed from us to the third party.

Recipients are not permitted to publish this report outside of their organisation without our express written consent.

APPENDIX B: Technical Glossary

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TECHNICAL GLOSSARY

The list of possible definitions within the report may be seen below. Please note that some definitions may not be relevant to this report.

HYDROGEOLOGY:

A **Principal Aquifer** is a layer of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Secondary (A) Aquifers consist of deposits with permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as Minor Aquifers.

Secondary (B) Aquifers consist of deposits with predominantly lower permeability layers with may stoke and yield limited amounts of groundwater due to localised features such as fissures, think permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

Secondary Aquifers (Undifferentiated) are assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both a minor aquifer and non-aquifer in different locations due to the variable characteristics of the rock type.

Unproductive Strata are rock layers with low permeability that have negligible significance for water supply or river base flow. These were formerly classified as non-aquifers.

FLOOD ZONES:

Environment Agency Flood Zone 2, defined as; land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.

Environment Agency Flood Zone 3 shows the extent of a river flood with a 1 in 100 (1%0 or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year.

Environment Agency Flood Zone 3 area that benefits from flood defences, defined as; land and property in this flood zone would have a high probability of flooding without the local flood defences. These protect the area against a river flood with a 1% chance of happening each year, or a flood from the sea with a 0.5% chance of happening each year.

GROUNDWATER SOURCE PROTECTION ZONES (SPZS):

Inner Zone (SPZ1): This zone is 50 day travel time of pollutant to source with a 50 metres default minimum radius.

Outer Zone (SPZ2): This zone is 400 day travel time of pollutant to source. This has a 250 or 500 metres minimum radius around the source depending on the amount of water taken.

Total Catchment (SPZ3): This is the area around a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken. This could extend some distance from the source point.

Zone of Special Interest (SPZ4): This zone is where local conditions require additional protection.

IN-SITU STRENGTH GEOTECHNICAL TESTING:

Windowless Sample and/or Cable Percussion and/or Rotary Boreholes provide samples of the ground for assessment but they do not give any engineering data. The standard penetration test (SPT) is an in-situ dynamic penetration test designed to provide information on the geotechnical engineering properties of soil. The test uses a thick-walled sample tube, with an outside diameter of 50mm and an inside diameter of 35mm, and a length of around 650mm. This is driven into the ground at the bottom of a borehole by blows from a slide hammer with a weight of 63.5kg falling through a distance of 760mm. The sample tube is driven 150mm into the ground and then the number of blows needed for the tube to penetrate each 75mm up to a depth of 450mm is recorded. The sum of the number of blows is termed the "standard penetration resistance" or the "N-value".

Dynamic Probing involves the driving of a metal cone into the ground via a series of steel rods. These rods are driven from the surface by a hammer system that lifts and drops a 63.5kg (SHDP) hammer onto the top of the rods through a set height, thus ensuring a consistent energy input. The number of hammer blows that are required to drive the cone down by each 100mm increment are recorded. These blow counts then provide a comparative assessment from which correlations have been published, based on dynamic energy, which permits engineering parameters to be generated. (The Dynamic Probe 'Super Heavy' (SHDP) Tests were conducted in accordance with BS 1377; 1990; Part 9, Clause 3.2).

APPENDIX C:
Chemical
Laboratory Testing

2 The Long Barn, Norton Farm, Selborne Road, Alton, Hampshire GU34 3NB
0333 600 1221 enquiries@groundandwater.co.uk **groundandwater.co.uk**

Registered Office: Kineton House, 31 Horse Fair, Banbury, Oxfordshire OX16 0AE Registered in England No. 07032001

Units 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528777
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Ground and Water Ltd
Head Office
2 The Long Barn
Norton Farm, Selborne Road
Alton
Hampshire
GU34 3NB

Attention: Aubyn Shortland

CERTIFICATE OF ANALYSIS

Date of report Generation:	07 November 2023
Customer:	Ground and Water Ltd
Sample Delivery Group (SDG):	231011-65
Your Reference:	GWPR5623
Location:	Alton Pond, Hampshire
Report No:	710062
Order Number:	GWPR5623

This report has been revised and directly supersedes 709240 in its entirety.

We received 7 samples on Wednesday October 11, 2023 and 7 of these samples were scheduled for analysis which was completed on Thursday October 26, 2023. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan
Operations Manager

1291

CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
28762859	Entrance		0.00 - 0.00	06/10/2023
28762866	Exit		0.00 - 0.00	06/10/2023
28762874	TP01		1.10	06/10/2023
28762879	TP02		1.20	06/10/2023
28762883	TP03		1.20	06/10/2023
28762888	TP04		0.70	06/10/2023
28762894	TP05		0.50	06/10/2023

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Results Legend
X Test
N No Determination Possible

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water
Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)	28762859					28762866					28762874			28762879		28762883		28762888	28762894
			Customer Sample Reference	Entrance					Exit					TP01			TP02		TP03		TP04	TP05
			AGS Reference																				
			Depth (m)	0.00 - 0.00					0.00 - 0.00					1.10			1.20		1.20		0.70	0.50
			Container	0.5l glass bottle (ALE227)	250ml Amber Gl. PTFE/PE (ALE208)	500ml Plastic (ALE208)	HNO3 Filtered (ALE204)	Vial (ALE297)	0.5l glass bottle (ALE227)	250ml Amber Gl. PTFE/PE (ALE208)	500ml Plastic (ALE208)	HNO3 Filtered (ALE204)	Vial (ALE297)	1kg Cardboard Container	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg Cardboard Container	250g Amber Jar (ALE210)	1kg Cardboard Container	250g Amber Jar (ALE210)	1kg Cardboard Container	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg Cardboard Container
			Sample Type	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	S	S	S	S	S	S	S	S	S	S	S
ANC at pH4 and ANC at pH 6	All	NDPs: 0 Tests: 1													X								
Anions by Kone (soil)	All	NDPs: 0 Tests: 5													X			X		X		X	
Anions by Kone (w)	All	NDPs: 1 Tests: 2			X					X				N									
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 5												X			X		X		X		X
Asbestos Quantification - Full	All	NDPs: 0 Tests: 1																					X
Boron Water Soluble	All	NDPs: 0 Tests: 5													X			X		X		X	
CEN Readings	All	NDPs: 1 Tests: 0												N									
Coronene	All	NDPs: 0 Tests: 1													X								
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 7			X					X					X			X		X		X	
Dissolved Metals by ICP-MS	All	NDPs: 1 Tests: 2				X					X			N									
Dissolved Organic/Inorganic Carbon	All	NDPs: 1 Tests: 0												N									
EPH by GCxGC-FID	All	NDPs: 0 Tests: 1													X								
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 2		X					X														
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 2		X					X														
EPH CWG GC (S)	All	NDPs: 0 Tests: 2													X							X	

28762894	TP05		0.50	250g Amber Jar (ALE210)	S
					X
					X
					X

CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Results Legend
X Test
N No Determination Possible

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water
Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)	28762859					28762866					28762874	28762879	28762883	28762888	28762894
			Customer Sample Reference	Entrance					Exit					TP01	TP02	TP03	TP04	TP05
			AGS Reference															
			Depth (m)	0.00 - 0.00					0.00 - 0.00					1.10	1.20	1.20	0.70	0.50
			Container	0.5l glass bottle (ALE227)	250ml Amber Gl. PTFE/PE (ALE208)	500ml Plastic (ALE204)	HNO3 Filtered (ALE204)	Vial (ALE297)	0.5l glass bottle (ALE227)	250ml Amber Gl. PTFE/PE (ALE208)	500ml Plastic (ALE204)	HNO3 Filtered (ALE204)	Vial (ALE297)	1kg Cardboard Container	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg Cardboard Container	250g Amber Jar (ALE210)	1kg Cardboard Container	250g Amber Jar (ALE210)	1kg Cardboard Container	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg Cardboard Container
			Sample Type	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	S	S	S	S	S	S	S	S	S	S	S
Fluoride	All	NDPs: 1 Tests: 0												N										
GRO by GC-FID (S)	All	NDPs: 0 Tests: 2														X							X	
GRO by GC-FID (W)	All	NDPs: 0 Tests: 2						X					X											
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 5													X				X		X		X	
Hexavalent Chromium (w)	All	NDPs: 0 Tests: 2				X					X													
Loss on Ignition in soils	All	NDPs: 0 Tests: 1													X									
Mercury Dissolved	All	NDPs: 1 Tests: 2					X					X		N										
Metals in solid samples by OES	All	NDPs: 0 Tests: 5													X				X		X		X	
PAH 16 & 17 Calc	All	NDPs: 0 Tests: 1													X									
PAH by GCMS	All	NDPs: 0 Tests: 5													X				X		X		X	
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 2			X					X														
PCBs by GCMS	All	NDPs: 0 Tests: 1													X									
pH	All	NDPs: 0 Tests: 5													X				X		X		X	
pH Value	All	NDPs: 0 Tests: 2				X					X													
pH Value of Filtered Water	All	NDPs: 1 Tests: 0												N										

28762894	TP05		0.50	250g Amber Jar (ALE210)	S
					X
					X
					X
					X

CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Results Legend
X Test
N No Determination Possible

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water
Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type
			28762859	Entrance		0.00 - 0.00	0.5l glass bottle (ALE227)	SW
							250ml Amber Gl. PTFE/PE (ALE208)	SW
							500ml Plastic (ALE208)	SW
							HNO3 Filtered (ALE204)	SW
							Vial (ALE297)	SW
			28762866	Exit		0.00 - 0.00	0.5l glass bottle (ALE227)	SW
							250ml Amber Gl. PTFE/PE (ALE208)	SW
							500ml Plastic (ALE208)	SW
							HNO3 Filtered (ALE204)	SW
							Vial (ALE297)	SW
			28762874	TP01		1.10	1kg Cardboard Container (ALE210)	S
							250g Amber Jar (ALE210)	S
							60g VOC (ALE215)	S
			28762879	TP02		1.20	1kg Cardboard Container (ALE210)	S
							250g Amber Jar (ALE210)	S
			28762883	TP03		1.20	1kg Cardboard Container (ALE210)	S
							250g Amber Jar (ALE210)	S
			28762888	TP04		0.70	1kg Cardboard Container (ALE210)	S
							250g Amber Jar (ALE210)	S
							60g VOC (ALE215)	S
			28762894	TP05		0.50	1kg Cardboard Container (ALE210)	S
Phenols by HPLC (S)	All	NDPs: 0 Tests: 5						

28762894	TP05		0.50	250g Amber Jar (ALE210)	S
					X
					X
					X

CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
28762874	TP01	1.10	Dark Brown	N/A	None	Vegetation
28762879	TP02	1.20	Dark Brown	N/A	None	None
28762883	TP03	1.20	Dark Brown	N/A	None	None
28762888	TP04	0.70	Dark Brown	N/A	None	Vegetation
28762894	TP05	0.50	Dark Brown	N/A	Stones	Vegetation

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Entrance	Exit	TP01	TP02	TP03	TP04
			Depth (m)	0.00 - 0.00	0.00 - 0.00	1.10	1.20	1.20	0.70
			Sample Type	Surface Water (SW)	Surface Water (SW)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	06/10/2023	06/10/2023	06/10/2023	06/10/2023	06/10/2023	06/10/2023
			Sampled Time	00:00	00:00	00:00	00:00	00:00	00:00
			Date Received	11/10/2023	11/10/2023	11/10/2023	11/10/2023	11/10/2023	11/10/2023
			SDG Ref	231011-65	231011-65	231011-65	231011-65	231011-65	231011-65
			Lab Sample No.(s)	28762859	28762866	28762874	28762879	28762883	28762888
			AGS Reference						
Arsenic (diss.filt)	<0.5 µg/l	TM152		0.539 #	0.515 #				
Boron (diss.filt)	<10 µg/l	TM152		24.1 #	31.7 #				
Cadmium (diss.filt)	<0.08 µg/l	TM152		<0.08 #	<0.08 #				
Chromium (diss.filt)	<1 µg/l	TM152		<1 #	<1 #				
Copper (diss.filt)	<0.3 µg/l	TM152		0.425 #	0.304 #				
Lead (diss.filt)	<0.2 µg/l	TM152		0.411 #	0.262 #				
Nickel (diss.filt)	<0.4 µg/l	TM152		0.46 #	0.53 #				
Selenium (diss.filt)	<1 µg/l	TM152		<1 #	<1 #				
Vanadium (diss.filt)	<1 µg/l	TM152		<1 #	<1 #				
Zinc (diss.filt)	<1 µg/l	TM152		2.66 #	8.17 #				
Mercury (diss.filt)	<0.01 µg/l	TM183		<0.01	<0.01				
Sulphate	<2000 µg/l	TM184		10900 #	16400 #				
Cyanide, Total	<50 µg/l	TM227		<50 2	<50 2				
Chromium, Hexavalent	<30 µg/l	TM241		<30	<30				
pH	<1 pH Units	TM256		8.09 #	8.36 #				
Phenol	<2 µg/l	TM259		<2 2	<2 2				
Cresols	<6 µg/l	TM259		<6 2	<6 2				
Xylenols	<8 µg/l	TM259		<8 2	<8 2				
Phenols, Total Detected monohydric	<16 µg/l	TM259		<16 2	<16 2				
Moisture Content Ratio (% of as received sample)	%	PM024				75	74	72	76
Loss on ignition	<0.7 %	TM018				18.4			
Phenol	<0.01 mg/kg	TM062 (S)				<0.01 #	<0.01	<0.01	<0.01
Cresols	<0.01 mg/kg	TM062 (S)				<0.01 #	<0.01	<0.01	0.041
Xylenols	<0.015 mg/kg	TM062 (S)				<0.015 #	<0.015	<0.015	<0.015
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)				<0.035 #	<0.035	<0.035	<0.035
Organic Carbon, Total	<0.2 %	TM132				7.43 #	7.01	8.54	12.9
Soil Organic Matter (SOM)	<0.35 %	TM132				12.8 #	12.1	14.7	22.2
pH	1 pH Units	TM133				7.9	7.88	7.64	7.71
Chromium, Hexavalent	<0.6 mg/kg	TM151				<0.6	<0.6	<0.6	<0.6
Cyanide, Total	<1 mg/kg	TM153				<1	<1	<1	<1
PCB congener 28	<0.003 mg/kg	TM168				<0.03			
PCB congener 52	<0.003 mg/kg	TM168				<0.03			

Results Legend
ISO17025 accredited.
M *m*CERTS accredited.
aq Aqueous / settled sample.
diss.filt Dissolved / filtered sample.
tot.unfilt Total / unfiltered sample.
* Subcontracted - refer to subcontractor report for accreditation status.
** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F) Trigger breach confirmed
1-4+5@ Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Entrance	Exit	TP01	TP02	TP03	TP04
			Depth (m)	0.00 - 0.00	0.00 - 0.00	1.10	1.20	1.20	0.70
			Sample Type	Surface Water (SW)	Surface Water (SW)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	06/10/2023	06/10/2023	06/10/2023	06/10/2023	06/10/2023	06/10/2023
			Sampled Time	00:00	00:00	00:00	00:00	00:00	00:00
			Date Received	11/10/2023	11/10/2023	11/10/2023	11/10/2023	11/10/2023	11/10/2023
			SDG Ref	231011-65	231011-65	231011-65	231011-65	231011-65	231011-65
			Lab Sample No.(s)	28762859	28762866	28762874	28762879	28762883	28762888
			AGS Reference						
PCB congener 101	<0.003 mg/kg	TM168				<0.03			
PCB congener 118	<0.003 mg/kg	TM168				<0.03			
PCB congener 138	<0.003 mg/kg	TM168				<0.03			
PCB congener 153	<0.003 mg/kg	TM168				<0.03			
PCB congener 180	<0.003 mg/kg	TM168				<0.03			
Sum of detected PCB 7 Congeners	<0.021 mg/kg	TM168				<0.21			
Arsenic	<0.6 mg/kg	TM181				4.55 #	4.03	7.91	6.98
Cadmium	<0.02 mg/kg	TM181				0.556 #	0.742	1.16	0.942
Chromium	<0.9 mg/kg	TM181				17.2 #	17.6	22.5	32
Copper	<1.4 mg/kg	TM181				47.9 #	49.9	81.4	88.2
Lead	<0.7 mg/kg	TM181				165 #	202	446	271
Mercury	<0.1 mg/kg	TM181				0.151 #	0.181	0.83	0.455
Nickel	<0.2 mg/kg	TM181				13.9 #	11.1	16.8	19.4
Selenium	<1 mg/kg	TM181				2.53 #	2.93	2.93	2.79
Vanadium	<0.2 mg/kg	TM181				17.5 #	15.5	24.2	25.8
Zinc	<1.9 mg/kg	TM181				325 #	367	474	488
ANC @ pH 4	<0.03 mol/kg	TM182				2.58			
ANC @ pH 6	<0.03 mol/kg	TM182				0.0427			
Boron, water soluble	<1 mg/kg	TM222				<1	<1	<1	1.05
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243				0.058	0.235	0.151	0.101
PAH Total 17 (inc Coronene) Moisture Corrected	<10 mg/kg	TM410				39			
Coronene	<0.2 mg/kg	TM410				1.19			
EPH Surrogate % recovery**	%	TM415				86			
Mineral Oil >C10-C40 (EH_2D_AL)	<5 mg/kg	TM415				158			

Results Legend		Customer Sample Ref.	TP05
#	ISO17025 accredited.		
M	mCERTS accredited.		
aq	Aqueous / settled sample.	Depth (m)	0.50
diss.filt	Dissolved / filtered sample.	Sample Type	Soil/Solid (S)
tot.unfilt	Total / unfiltered sample.	Date Sampled	06/10/2023
*	Subcontracted - refer to subcontractor report for accreditation status.	Sampled Time	00:00
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery	Date Received	11/10/2023
		SDG Ref	231011-65
(F)	Trigger breach confirmed	Lab Sample No.(s)	28762894
1-4+§@	Sample deviation (see appendix)	AGS Reference	

Component	LOD/Units	Method	
Moisture Content Ratio (% of as received sample)	%	PM024	75
Phenol	<0.01 mg/kg	TM062 (S)	<0.01
Cresols	<0.01 mg/kg	TM062 (S)	0.04
Xylenols	<0.015 mg/kg	TM062 (S)	<0.015
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)	<0.035
Organic Carbon, Total	<0.2 %	TM132	13.5 #
Soil Organic Matter (SOM)	<0.35 %	TM132	23.3 #
pH	1 pH Units	TM133	7.34
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6
Cyanide, Total	<1 mg/kg	TM153	<1
Arsenic	<0.6 mg/kg	TM181	7.32
Cadmium	<0.02 mg/kg	TM181	1.32
Chromium	<0.9 mg/kg	TM181	31.2
Copper	<1.4 mg/kg	TM181	87.4
Lead	<0.7 mg/kg	TM181	271
Mercury	<0.1 mg/kg	TM181	0.163
Nickel	<0.2 mg/kg	TM181	18.6
Selenium	<1 mg/kg	TM181	2.37
Vanadium	<0.2 mg/kg	TM181	24.8
Zinc	<1.9 mg/kg	TM181	705
Boron, water soluble	<1 mg/kg	TM222	1.47
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243	0.13
Asbestos Quantification - Gravimetric - %	<0.001 %	TM304	<0.001 #
Asbestos Quantification - PCOM Evaluation - %	<0.001 %	TM304	<0.001 #
Additional Asbestos Components (Using TM048)		TM304	None #
Analysts Comments		TM304	N/A
Asbestos Quantification - Total - %	<0.001 %	TM304	<0.001 #

CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	TP01	TP02	TP03	TP04	TP05
			Depth (m)	1.10	1.20	1.20	0.70	0.50
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	06/10/2023	06/10/2023	06/10/2023	06/10/2023	06/10/2023
			Sampled Time	00:00	00:00	00:00	00:00	00:00
			Date Received	11/10/2023	11/10/2023	11/10/2023	11/10/2023	11/10/2023
			SDG Ref	231011-65	231011-65	231011-65	231011-65	231011-65
			Lab Sample No.(s)	28762874	28762879	28762883	28762888	28762894
			AGS Reference					
Naphthalene-d8 % recovery**	%	TM218		92	94.3	90.2	97.5	89
Acenaphthene-d10 % recovery**	%	TM218		88.9	94.9	87.9	94.2	88.2
Phenanthrene-d10 % recovery**	%	TM218		86.3	92.7	87.7	91.1	90.6
Chrysene-d12 % recovery**	%	TM218		90.8	91.2	84.1	100	88
Perylene-d12 % recovery**	%	TM218		98	96.3	88.8	103	90.4
Naphthalene	<0.009 mg/kg	TM218		<0.09 #	<0.09 #	<0.09	<0.09 #	<0.09
Acenaphthylene	<0.012 mg/kg	TM218		<0.12 #	<0.12 #	0.906	<0.12 #	<0.12
Acenaphthene	<0.008 mg/kg	TM218		<0.08 #	<0.08 #	0.392	<0.08 #	<0.08
Fluorene	<0.01 mg/kg	TM218		<0.1 #	<0.1 #	0.457	<0.1 #	<0.1
Phenanthrene	<0.015 mg/kg	TM218		1.19 #	1.24 #	4.04	1.55 #	4.33
Anthracene	<0.016 mg/kg	TM218		<0.16 #	<0.16 #	1.72	<0.16 #	<0.32
Fluoranthene	<0.017 mg/kg	TM218		4.98 #	5.5 #	17.9	5.81 #	14.4
Pyrene	<0.015 mg/kg	TM218		4.39 #	4.83 #	15.5	5.24 #	12.5
Benz(a)anthracene	<0.014 mg/kg	TM218		2.94 #	2.92 #	9.27	3.24 #	7.08
Chrysene	<0.01 mg/kg	TM218		3.44 #	3.6 #	9.63	3.69 #	7.75
Benzo(b)fluoranthene	<0.015 mg/kg	TM218		6.2 #	5.68 #	16.3	5.08 #	9.63
Benzo(k)fluoranthene	<0.014 mg/kg	TM218		2.2 #	2.37 #	6.23	2.34 #	3.9
Benzo(a)pyrene	<0.015 mg/kg	TM218		4.81 #	4.55 #	14.1	4.47 #	8.35
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218		3.41 #	3.68 #	8.89	3.09 #	4.81
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218		<0.23 #	<0.23 #	1.73	<0.23 #	<0.46
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218		4.29 #	3.77 #	10.5	3.69 #	5.76
PAH, Total Detected USEPA 16	<0.118 mg/kg	TM218		37.8	38.2	118	38.2	78.6

CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Entrance	Exit
			Depth (m)	0.00 - 0.00	0.00 - 0.00
			Sample Type	Surface Water (SW)	Surface Water (SW)
			Date Sampled	06/10/2023	06/10/2023
			Sampled Time	00:00	00:00
			Date Received	11/10/2023	11/10/2023
			SDG Ref	231011-65	231011-65
			Lab Sample No.(s)	28762859	28762866
			AGS Reference		
Naphthalene (aq)	<0.01 µg/l	TM178		<0.01 #	<0.01 #
Acenaphthene (aq)	<0.005 µg/l	TM178		<0.005 #	<0.005 #
Acenaphthylene (aq)	<0.005 µg/l	TM178		<0.005 #	<0.005 #
Fluoranthene (aq)	<0.005 µg/l	TM178		0.0218 #	0.047 #
Anthracene (aq)	<0.005 µg/l	TM178		<0.005 #	<0.005 #
Phenanthrene (aq)	<0.005 µg/l	TM178		<0.005 #	0.0176 #
Fluorene (aq)	<0.005 µg/l	TM178		<0.005 #	<0.005 #
Chrysene (aq)	<0.005 µg/l	TM178		0.0096 #	<0.005 #
Pyrene (aq)	<0.005 µg/l	TM178		0.0191 #	0.0331 #
Benzo(a)anthracene (aq)	<0.005 µg/l	TM178		<0.005 #	<0.005 #
Benzo(b)fluoranthene (aq)	<0.005 µg/l	TM178		<0.005 #	0.0275 #
Benzo(k)fluoranthene (aq)	<0.005 µg/l	TM178		<0.005 #	0.0083 #
Benzo(a)pyrene (aq)	<0.002 µg/l	TM178		<0.002 #	<0.002 #
Dibenzo(a,h)anthracene (aq)	<0.005 µg/l	TM178		<0.005 #	<0.005 #
Benzo(g,h,i)perylene (aq)	<0.005 µg/l	TM178		<0.005 #	<0.005 #
Indeno(1,2,3-cd)pyrene (aq)	<0.005 µg/l	TM178		<0.005 #	<0.005 #
PAH, Total Detected USEPA 16 (aq)	<0.082 µg/l	TM178		<0.082 #	0.134 #

TPH CWG (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.							
			TP01	TP04						
Depth (m)			1.10	0.70						
Sample Type			Soil/Solid (S)	Soil/Solid (S)						
Date Sampled			06/10/2023	06/10/2023						
Sampled Time			00:00	00:00						
Date Received			11/10/2023	11/10/2023						
SDG Ref			231011-65	231011-65						
Lab Sample No.(s)			28762874	28762888						
AGS Reference										
GRO Surrogate % recovery**	%	TM089	81.9	71.3						
Aliphatics >C5-C6 (HS_1D_AL)	<0.01 mg/kg	TM089	<0.01	<0.01						
Aliphatics >C6-C8 (HS_1D_AL)	<0.01 mg/kg	TM089	<0.01	<0.01						
Aliphatics >C8-C10 (HS_1D_AL)	<0.01 mg/kg	TM089	<0.01	<0.01						
Aliphatics >C10-C12 (EH_2D_AL_#1)	<1 mg/kg	TM414	<1 #	<1 3 #						
Aliphatics >C12-C16 (EH_2D_AL_#1)	<1 mg/kg	TM414	2.21 #	<1 3 #						
Aliphatics >C16-C21 (EH_2D_AL_#1)	<1 mg/kg	TM414	75.2 #	31.3 3 #						
Aliphatics >C21-C35 (EH_2D_AL_#1)	<1 mg/kg	TM414	254 #	207 3 #						
Aliphatics >C35-C44 (EH_2D_AL_#1)	<1 mg/kg	TM414	33.8	37.6 3						
Total Aliphatics >C10-C44 (EH_2D_AR_#1)	<5 mg/kg	TM414	366	277 3						
Total Aliphatics & Aromatics >C10-C44 (EH_2D_Total_#1)	<10 mg/kg	TM414	941	711 3						
Aromatics >EC5-EC7 (HS_1D_AR)	<0.01 mg/kg	TM089	<0.01	<0.01						
Aromatics >EC7-EC8 (HS_1D_AR)	<0.01 mg/kg	TM089	<0.01	<0.01						
Aromatics >EC8-EC10 (HS_1D_AR)	<0.01 mg/kg	TM089	<0.01	<0.01						
Aromatics > EC10-EC12 (EH_2D_AR_#1)	<1 mg/kg	TM414	<1 #	<1 3 #						
Aromatics > EC12-EC16 (EH_2D_AR_#1)	<1 mg/kg	TM414	1.21 #	<1 3 #						
Aromatics > EC16-EC21 (EH_2D_AR_#1)	<1 mg/kg	TM414	41.7 #	20.6 3 #						
Aromatics > EC21-EC35 (EH_2D_AR_#1)	<1 mg/kg	TM414	385 #	298 3 #						
Aromatics >EC35-EC44 (EH_2D_AR_#1)	<1 mg/kg	TM414	148	116 3						
Aromatics > EC40-EC44 (EH_2D_AR_#1)	<1 mg/kg	TM414	44.8	32.3 3						
Total Aromatics > EC10-EC44 (EH_2D_AR_#1)	<5 mg/kg	TM414	575	435 3						
Total Aliphatics & Aromatics >C5-C44 (EH_2D_Total_#1+HS_1D_Total)	<10 mg/kg	TM414	941	711						
Total Aliphatics >C5-C10 (HS_1D_AL_TOTAL)	<0.05 mg/kg	TM089	<0.05	<0.05						
Total Aromatics >EC5-EC10 (HS_1D_AR_TOTAL)	<0.05 mg/kg	TM089	<0.05	<0.05						
GRO >C5-C10 (HS_1D_TOTAL)	<0.02 mg/kg	TM089	<0.02	<0.02						

TPH CWG (W)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Entrance	Exit
			Depth (m)	0.00 - 0.00	0.00 - 0.00
			Sample Type	Surface Water (SW)	Surface Water (SW)
			Date Sampled	06/10/2023	06/10/2023
			Sampled Time	00:00	00:00
			Date Received	11/10/2023	11/10/2023
			SDG Ref	231011-65	231011-65
			Lab Sample No.(s)	28762859	28762866
			AGS Reference		
GRO Surrogate % recovery**	%	TM245		88	84
GRO >C5-C12	<50 µg/l	TM245		<50 #	<50 #
Aliphatics >C5-C6	<10 µg/l	TM245		<10	<10
Aliphatics >C6-C8	<10 µg/l	TM245		<10	<10
Aliphatics >C8-C10	<10 µg/l	TM245		<10	<10
Aliphatics >C10-C12	<10 µg/l	TM245		<10	<10
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174		<10	<10
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174		<10	<10
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174		<10	<10
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174		<10	<10
Aromatics >EC5-EC7	<10 µg/l	TM245		<10	<10
Aromatics >EC7-EC8	<10 µg/l	TM245		<10	<10
Aromatics >EC8-EC10	<10 µg/l	TM245		<10	<10
Aromatics >EC10-EC12	<10 µg/l	TM245		<10	<10
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174		<10	<10
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174		<10	<10
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174		<10	<10
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174		<10	<10
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174		<10	<10
Aliphatics >C16-C35 Aqueous	<10 µg/l	TM174		<10	<10

CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

VOC MS (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	TP01	TP04				
			Depth (m)	1.10	0.70				
			Sample Type	Soil/Solid (S)	Soil/Solid (S)				
			Date Sampled	06/10/2023	06/10/2023				
			Sampled Time	00:00	00:00				
			Date Received	11/10/2023	11/10/2023				
			SDG Ref	231011-65	231011-65				
			Lab Sample No.(s)	28762874	28762888				
			AGS Reference						
Dibromofluoromethane**	%	TM116		104	103				
Toluene-d8**	%	TM116		94.9	92.9				
4-Bromofluorobenzene**	%	TM116		93.9	88.1				
Methyl Tertiary Butyl Ether	<0.0005 mg/kg	TM116		<0.01 #	<0.01 #				
Benzene	<0.001 mg/kg	TM116		<0.02 #	<0.02 #				
Toluene	<0.001 mg/kg	TM116		<0.02 #	<0.02 #				
Ethylbenzene	<0.001 mg/kg	TM116		<0.02 #	<0.02 #				
p/m-Xylene	<0.002 mg/kg	TM116		<0.04 #	<0.04 #				
o-Xylene	<0.002 mg/kg	TM116		<0.04 #	<0.04 #				
Sum of Detected Xylenes	<0.02 mg/kg	TM116		<0.4	<0.4				
Sum of BTEX	<0.007 mg/kg	TM116		<0.14	<0.14				

CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

VOC MS (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Entrance	Exit
			Depth (m)	0.00 - 0.00	0.00 - 0.00
			Sample Type	Surface Water (SW)	Surface Water (SW)
			Date Sampled	06/10/2023	06/10/2023
			Sampled Time	00:00	00:00
			Date Received	11/10/2023	11/10/2023
			SDG Ref	231011-65	231011-65
			Lab Sample No.(s)	28762859	28762866
			AGS Reference		
Methyl tertiary butyl ether (MTBE)	<1 µg/l	TM208		<1 #	<1 #
Benzene	<1 µg/l	TM208		<1 #	<1 #
Toluene	<1 µg/l	TM208		<1 #	<1 #
Ethylbenzene	<1 µg/l	TM208		<1 #	<1 #
m,p-Xylene	<1 µg/l	TM208		<1 #	<1 #
o-Xylene	<1 µg/l	TM208		<1 #	<1 #
Sum of detected Xylenes	<2 µg/l	TM208		<2	<2
Sum of BTEX	<5 µg/l	TM208		<5	<5

CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Asbestos Identification - Solid Samples

Results Legend
ISO17025 accredited.
M *m*CERTS accredited.
* Subcontracted test.
(F) Trigger breach confirmed
1-5&♦§@ Sample deviation (see appendix)

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Asbestos Actinolite	Asbestos Anthophyllite	Asbestos Tremolite	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	TP01 1.10 SOLID 06/10/2023 00:00:00 11/10/2023 05:00:00 231011-65 28762874 TM048	17/10/2023	Alex Horner	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	TP02 1.20 SOLID 06/10/2023 00:00:00 11/10/2023 05:00:00 231011-65 28762879 TM048	17/10/2023	Odhran McLernon	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	TP03 1.20 SOLID 06/10/2023 00:00:00 11/10/2023 05:00:00 231011-65 28762883 TM048	17/10/2023	Odhran McLernon	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	TP04 0.70 SOLID 06/10/2023 00:00:00 11/10/2023 05:00:00 231011-65 28762888 TM048	17/10/2023	Odhran McLernon	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	TP05 0.50 SOLID 06/10/2023 00:00:00 11/10/2023 05:00:00 231011-65 28762894 TM048	17/10/2023	Odhran McLernon	Small ACM fragment typical of an asbestos board	Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

Asbestos Quantification - Full

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
*	Subcontracted test.
(F)	Trigger breach confirmed
1-5&♦§@	Sample deviation (see appendix)

		Additional Asbestos Components	Analysts Comments	Asbestos Quantification - Gravimetric - %	Asbestos Quantification - PCOM	Asbestos Quantification - Total - %
Cust. Sample Ref.	TP05	None (#)	N/A	<0.001 (#)	<0.001 (#)	<0.001 (#)
Depth (m)	0.50					
Sample Type	SOLID					
Date Sampled	06/10/2023 00:00:00					
Date Receieved	11/10/2023 05:00:00					
SDG	231011-65					
Original Sample	28762894					
Method Number	TM304					

Notification of NDPs (No determination possible)

Date Received : 11/10/2023 10:37:17

Sample No	Customer Sample Ref.	Depth (m)	Test	Comment
28762874	TP01	1.10	Dissolved Organic/Inorganic Carbon	Insufficient Sample
28762874	TP01	1.10	Fluoride	Insufficient Sample
28762874	TP01	1.10	Mercury Dissolved	Insufficient Sample
28762874	TP01	1.10	Dissolved Metals by ICP-MS	Insufficient Sample
28762874	TP01	1.10	Anions by Kone (w)	Insufficient Sample
28762874	TP01	1.10	Phenols by HPLC (W)	Insufficient Sample
28762874	TP01	1.10	pH Value of Filtered Water	Insufficient Sample
28762874	TP01	1.10	CEN 10:1 Leachate (1 Stage)	Insufficient Sample
28762874	TP01	1.10	CEN Readings	Insufficient Sample
28762874	TP01	1.10	pH Value of Filtered Water	Insufficient Sample

Table of Results - Appendix

Method No	Description
TM174	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID
TM182	Determination of Acid Neutralisation Capacity (ANC) Using Autotitration in Soils
TM183	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM241	The Determination of Hexavalent Chromium in Waters and Leachates using the Kone Analyser
TM245	Determination of GRO by Headspace in waters
TM414	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID
TM018	Determination of Loss on Ignition
TM116	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM132	ELTRA CS800 Operators Guide
TM133	Determination of pH in Soil and Water using the GLpH pH Meter
TM243	Mixed Anions In Soils By Kone
TM259	Determination of Phenols in Waters and Leachates by HPLC
TM410	Determination of Coronene in soils by GCMS
TM048	Identification of Asbestos in Bulk Material
TM062 (S)	Determination of Phenols in Soils by HPLC
TM152	Analysis of Aqueous Samples by ICP-MS
TM153	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser
TM168	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils
TM208	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters
TM218	The determination of PAH in soil samples by GC-MS
TM222	Determination of Hot Water Soluble Boron in Soils (10:1 Water:Soil) by ICP OES.
TM227	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate
TM256	Determination of pH, EC, TDS and Alkalinity in Aqueous samples
TM415	Determination of Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID
PM024	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM089	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM151	Determination of Hexavalent Chromium using Kone analyser
TM178	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters
TM181	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM304	Asbestos Quantification in Soil: Fibres identified by morphology only

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).

CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Test Completion Dates

Lab Sample No(s)	28762859	28762866	28762874	28762879	28762883	28762888	28762894
Customer Sample Ref.	Entrance	Exit	TP01	TP02	TP03	TP04	TP05
AGS Ref.							
Depth	0.00 - 0.00	0.00 - 0.00	1.10	1.20	1.20	0.70	0.50
Type	Surface Water	Surface Water	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
ANC at pH4 and ANC at pH 6			17-Oct-2023				
Anions by Kone (soil)			18-Oct-2023	18-Oct-2023	18-Oct-2023	18-Oct-2023	18-Oct-2023
Anions by Kone (w)	13-Oct-2023	13-Oct-2023					
Asbestos ID in Solid Samples			17-Oct-2023	17-Oct-2023	17-Oct-2023	17-Oct-2023	17-Oct-2023
Asbestos Quantification - Full							26-Oct-2023
Boron Water Soluble			18-Oct-2023	18-Oct-2023	18-Oct-2023	18-Oct-2023	18-Oct-2023
Coronene			18-Oct-2023				
Cyanide Comp/Free/Total/Thiocyanate	16-Oct-2023	16-Oct-2023	16-Oct-2023	16-Oct-2023	16-Oct-2023	16-Oct-2023	16-Oct-2023
Dissolved Metals by ICP-MS	17-Oct-2023	17-Oct-2023					
EPH by GCxGC-FID			16-Oct-2023				
EPH CWG (Aliphatic) Aqueous GC (W)	19-Oct-2023	19-Oct-2023					
EPH CWG (Aromatic) Aqueous GC (W)	19-Oct-2023	19-Oct-2023					
EPH CWG GC (S)			19-Oct-2023			19-Oct-2023	
GRO by GC-FID (S)			17-Oct-2023			17-Oct-2023	
GRO by GC-FID (W)	13-Oct-2023	13-Oct-2023					
Hexavalent Chromium (s)			16-Oct-2023	16-Oct-2023	16-Oct-2023	16-Oct-2023	16-Oct-2023
Hexavalent Chromium (w)	18-Oct-2023	18-Oct-2023					
Loss on Ignition in soils			18-Oct-2023				
Mercury Dissolved	13-Oct-2023	13-Oct-2023					
Metals in solid samples by OES			17-Oct-2023	17-Oct-2023	17-Oct-2023	17-Oct-2023	17-Oct-2023
Moisture at 105C			13-Oct-2023				
PAH 16 & 17 Calc			17-Oct-2023				
PAH by GCMS			16-Oct-2023	17-Oct-2023	17-Oct-2023	18-Oct-2023	17-Oct-2023
PAH Spec MS - Aqueous (W)	18-Oct-2023	18-Oct-2023					
PCBs by GCMS			18-Oct-2023				
pH			17-Oct-2023	17-Oct-2023	16-Oct-2023	17-Oct-2023	16-Oct-2023
pH Value	17-Oct-2023	17-Oct-2023					
Phenols by HPLC (S)			16-Oct-2023	16-Oct-2023	16-Oct-2023	16-Oct-2023	16-Oct-2023
Phenols by HPLC (W)	17-Oct-2023	17-Oct-2023					
Sample description			12-Oct-2023	12-Oct-2023	12-Oct-2023	12-Oct-2023	12-Oct-2023
Total Organic Carbon			18-Oct-2023	18-Oct-2023	18-Oct-2023	18-Oct-2023	19-Oct-2023
TPH CWG (W)	19-Oct-2023	19-Oct-2023					
TPH CWG GC (S)			19-Oct-2023			19-Oct-2023	
VOC MS (S)			16-Oct-2023			16-Oct-2023	
VOC MS (W)	12-Oct-2023	12-Oct-2023					

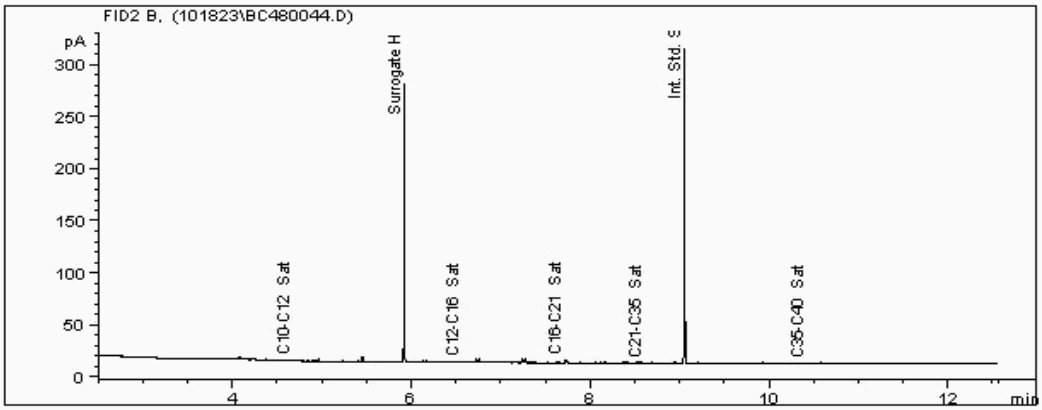
Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 28771417 **Depth :** 0.00 - 0.00
Sample ID : Entrance

Speciated TPH - SATS (C12 - C40)

Sample Identity: 26744348-
Date Acquired : 19/10/2023 10:16:19 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025

#	Compound Name	Main Peak Area	Amount
1	C10-C12 Sat	0.0	0.000
2	Surrogate H	193.2	0.196
3	C12-C16 Sat	0.0	0.000
4	C16-C21 Sat	0.0	0.000
5	C21-C35 Sat	0.0	0.000
6	Int. Std. S	231.1	0.250
7	C35-C40 Sat	0.0	0.000
	Total Peak Area	424.3	



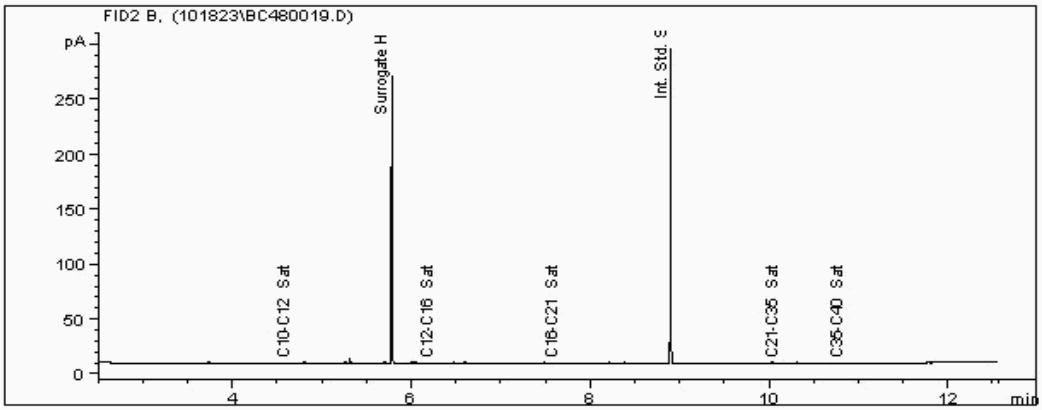
Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 28771426 **Depth :** 0.00 - 0.00
Sample ID : Exit

Speciated TPH - SATS (C12 - C40)

Sample Identity: 26744365-
Date Acquired : 18/10/2023 19:53:31 PM
Units : ppb
Dilution : SE EXIT[0.00 - 0.00] ->
CF : 1
Multiplier : 0.025

#	Compound Name	Main Peak Area	Amount
1	C10-C12 Sat	0.0	0.000
2	Surrogate H	177.0	0.212
3	C12-C16 Sat	0.0	0.000
4	C16-C21 Sat	0.0	0.000
5	Int. Std. S	222.6	0.253
6	C21-C35 Sat	0.0	0.000
7	C35-C40 Sat	0.0	0.000
	Total Peak Area	399.6	



CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

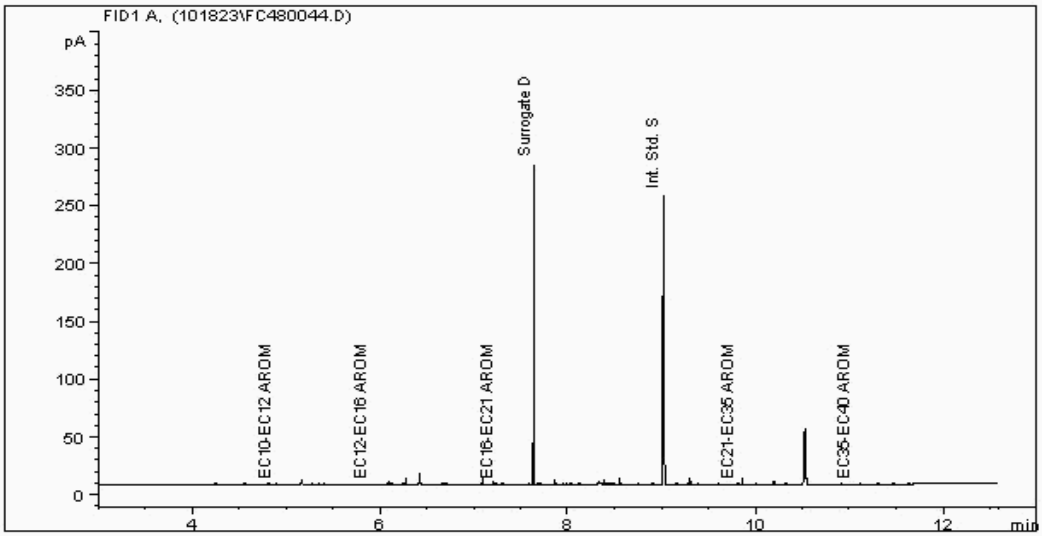
Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 28771417 **Depth :** 0.00 - 0.00
Sample ID : Entrance

Speciated TPH - AROM (C12 - C40)

Sample Identity: 26744349-
Date Acquired : 19/10/2023 10:16:18 PM
Units : ppb
Dilution:

#	Compound Name	Main Peak Area	Amount
1	EC10-EC12 AROM	0.0	0.000
2	EC12-EC16 AROM	0.0	0.000
3	EC16-EC21 AROM	0.0	0.000
4	Surrogate D	190.8	0.235
5	Int. Std. S	191.8	0.250
6	EC21-EC35 AROM	0.0	0.000
7	EC35-EC40 AROM	0.0	0.000
	Total Peak Area	382.6	



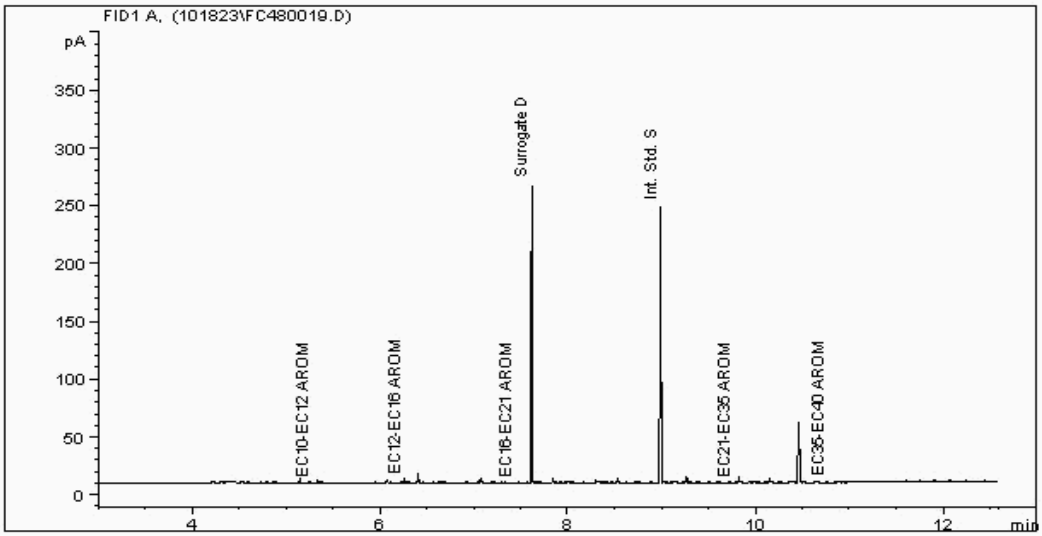
Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 28771426 **Depth :** 0.00 - 0.00
Sample ID : Exit

Speciated TPH - AROM (C12 - C40)

Sample Identity: 26744366-
Date Acquired : 18/10/2023 19:53:31 PM
Units : ppb
Dilution: SE EXIT[0.00 - 0.00] ->

#	Compound Name	Main Peak Area	Amount
1	EC10-EC12 AROM	0.0	0.000
2	EC12-EC16 AROM	0.0	0.000
3	EC16-EC21 AROM	0.0	0.000
4	Surrogate D	157.4	0.202
5	Int. Std. S	191.4	0.253
6	EC21-EC35 AROM	0.0	0.000
7	EC35-EC40 AROM	0.0	0.000
	Total Peak Area	348.9	



CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Chromatogram

Analysis: EPH CWG GC (S) **Sample No :** 28802633 **Depth :** 0.70
Sample ID : TP04

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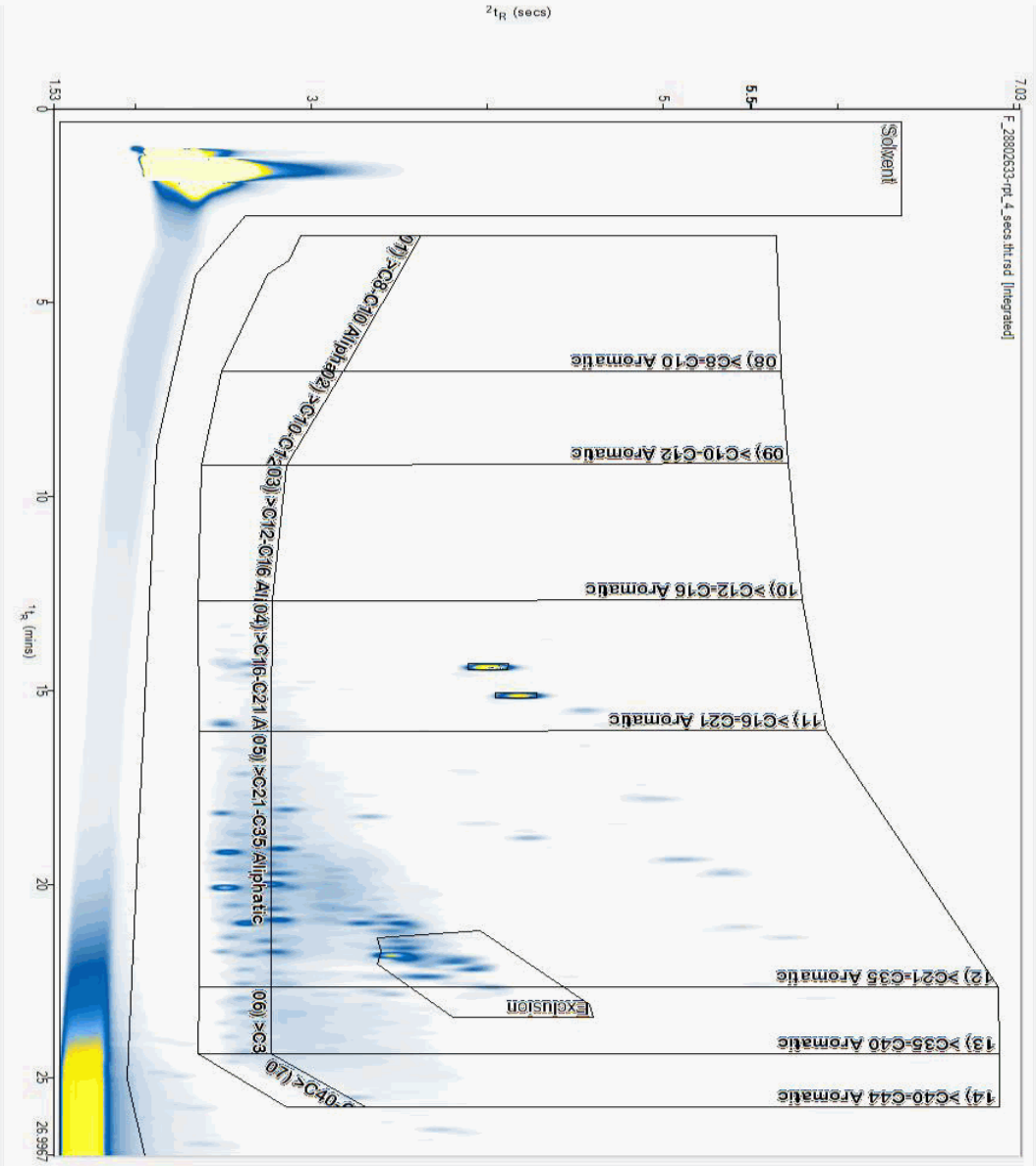
  Current batch
Sample Identity:  F_28802633-rpt_4_secs.tht
Date Acquired   :  19/10/23 09:59:04
Units           :  ppm
Dilution        :  0
CF              :
Multiplier      :
```

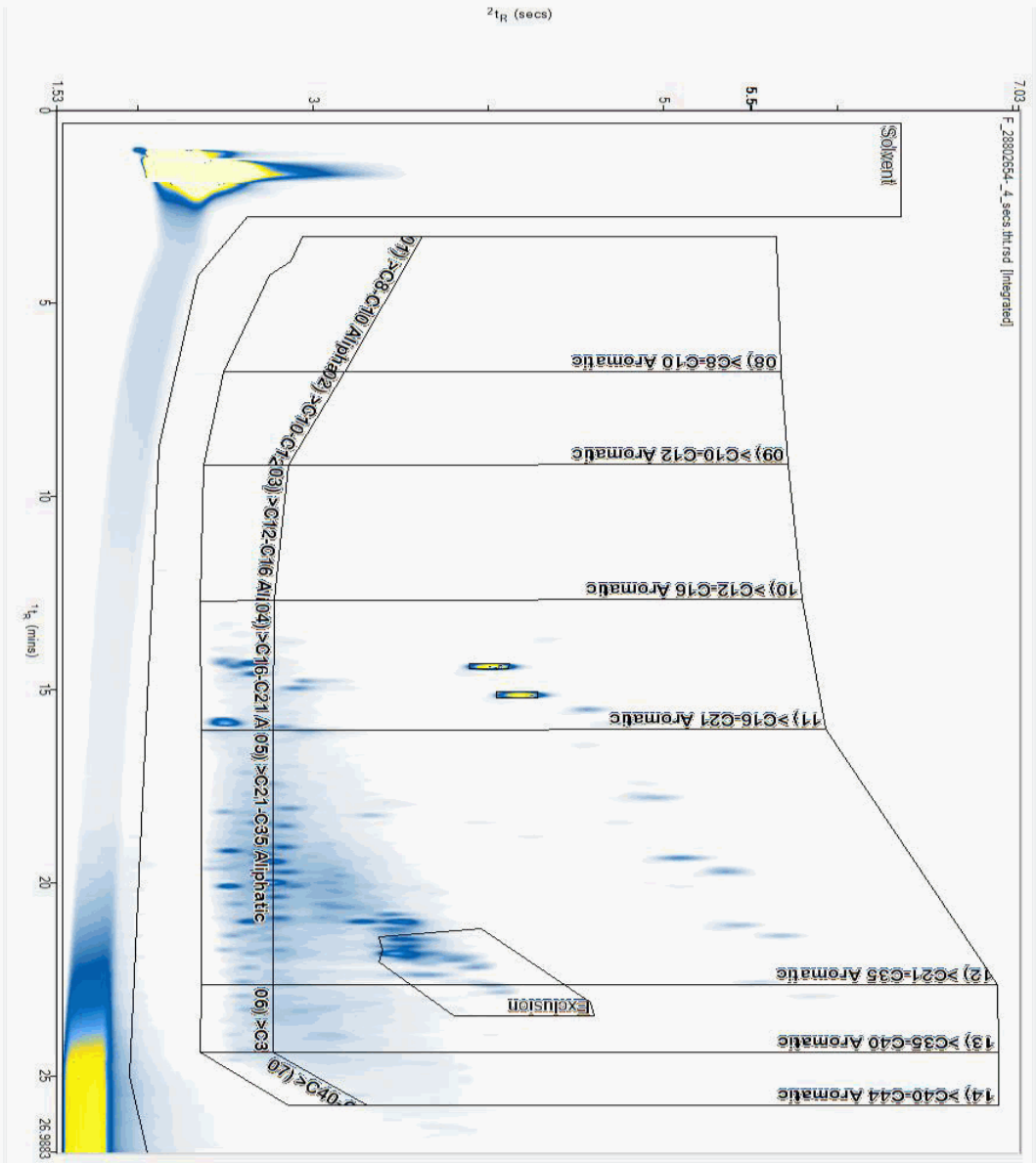


CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Chromatogram

Analysis: EPH CWG GC (S) **Sample No :** 28802654 **Depth :** 1.10
Sample ID : TP01

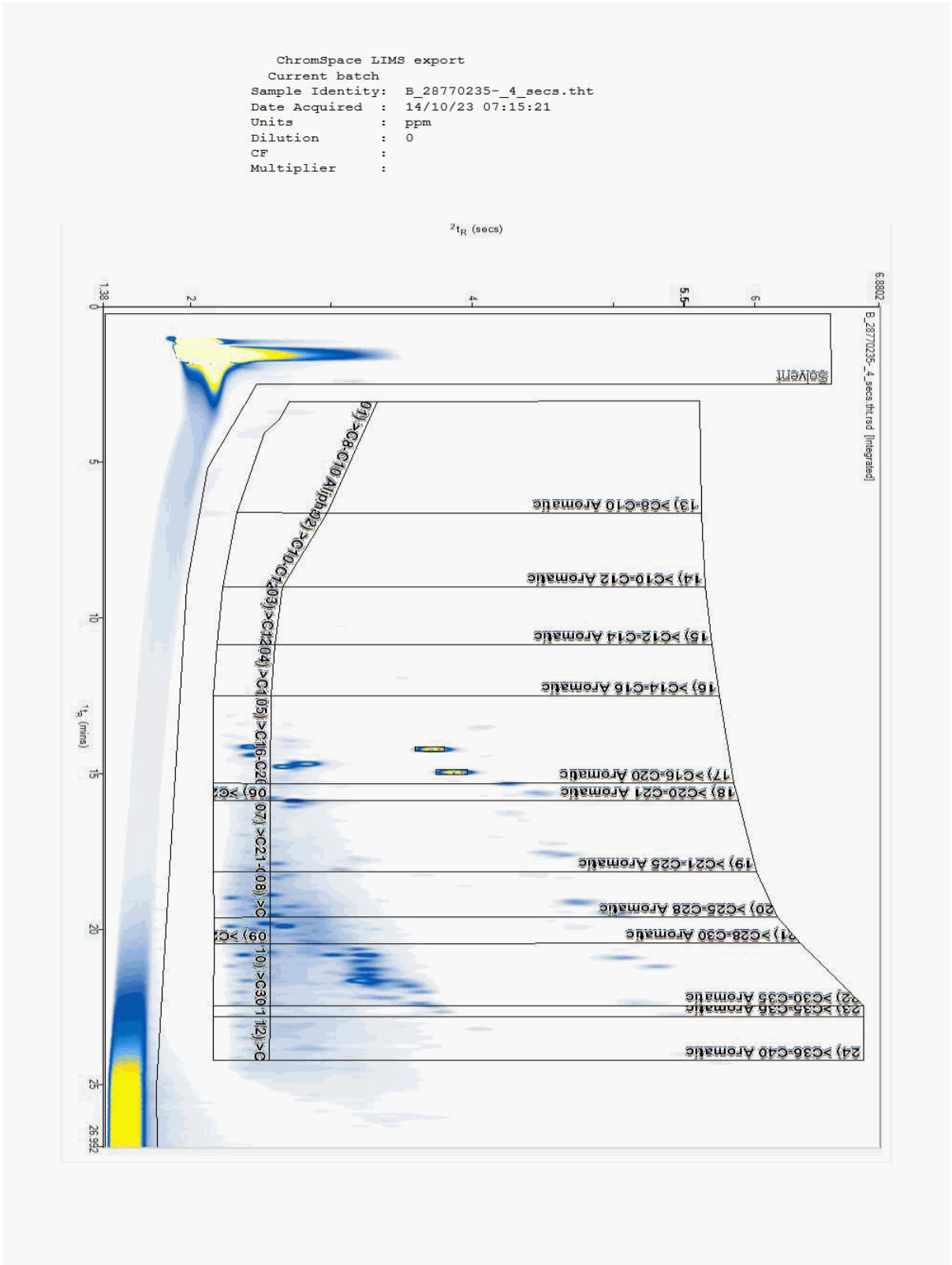


CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Chromatogram

Analysis: EPH by GCxGC-FID **Sample No :** 28770235 **Depth :** 1.10
Sample ID : TP01

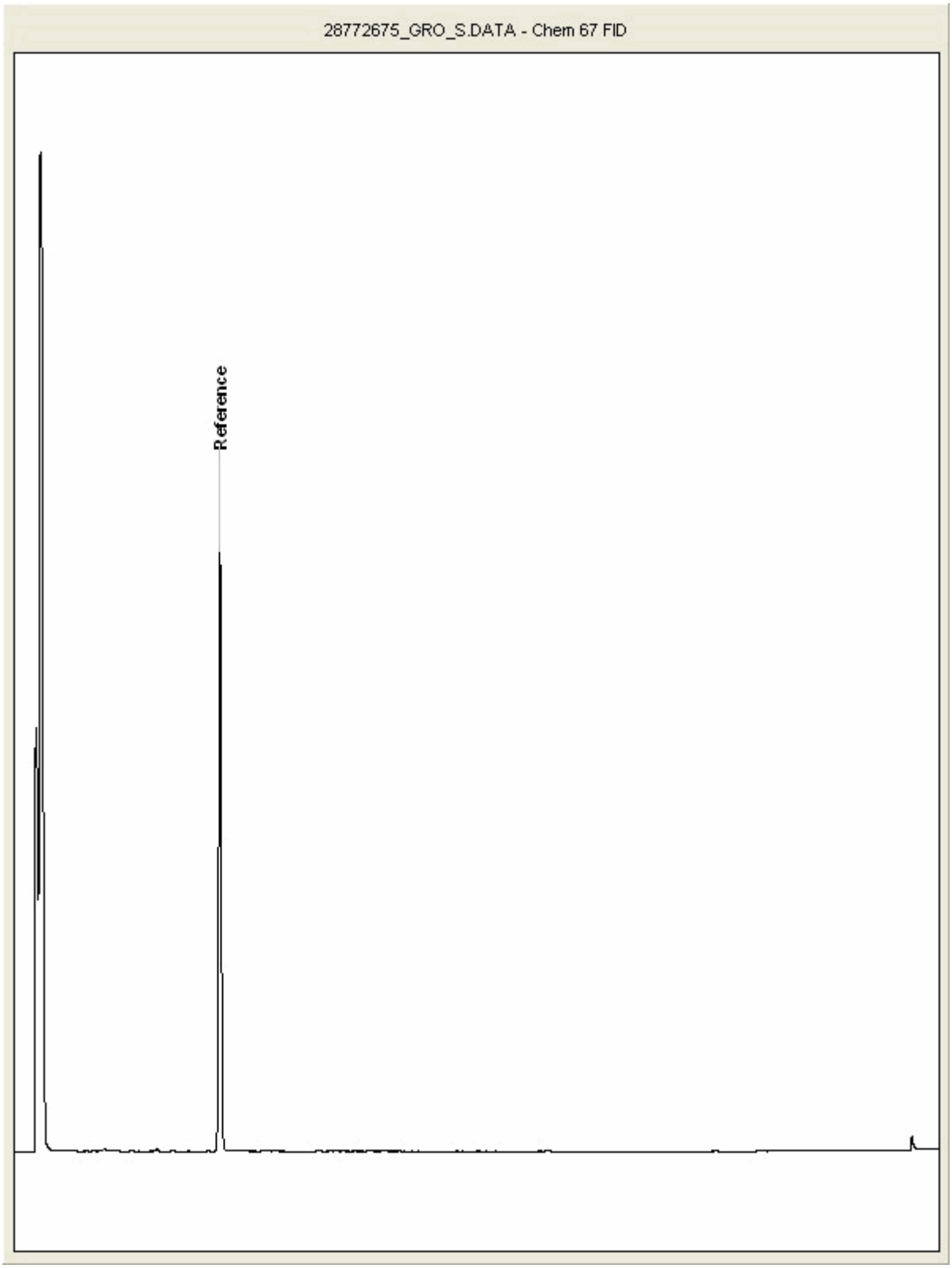


CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Chromatogram

Analysis: GRO by GC-FID (S) **Sample No :** 28772675 **Depth :** 1.10
Sample ID : TP01

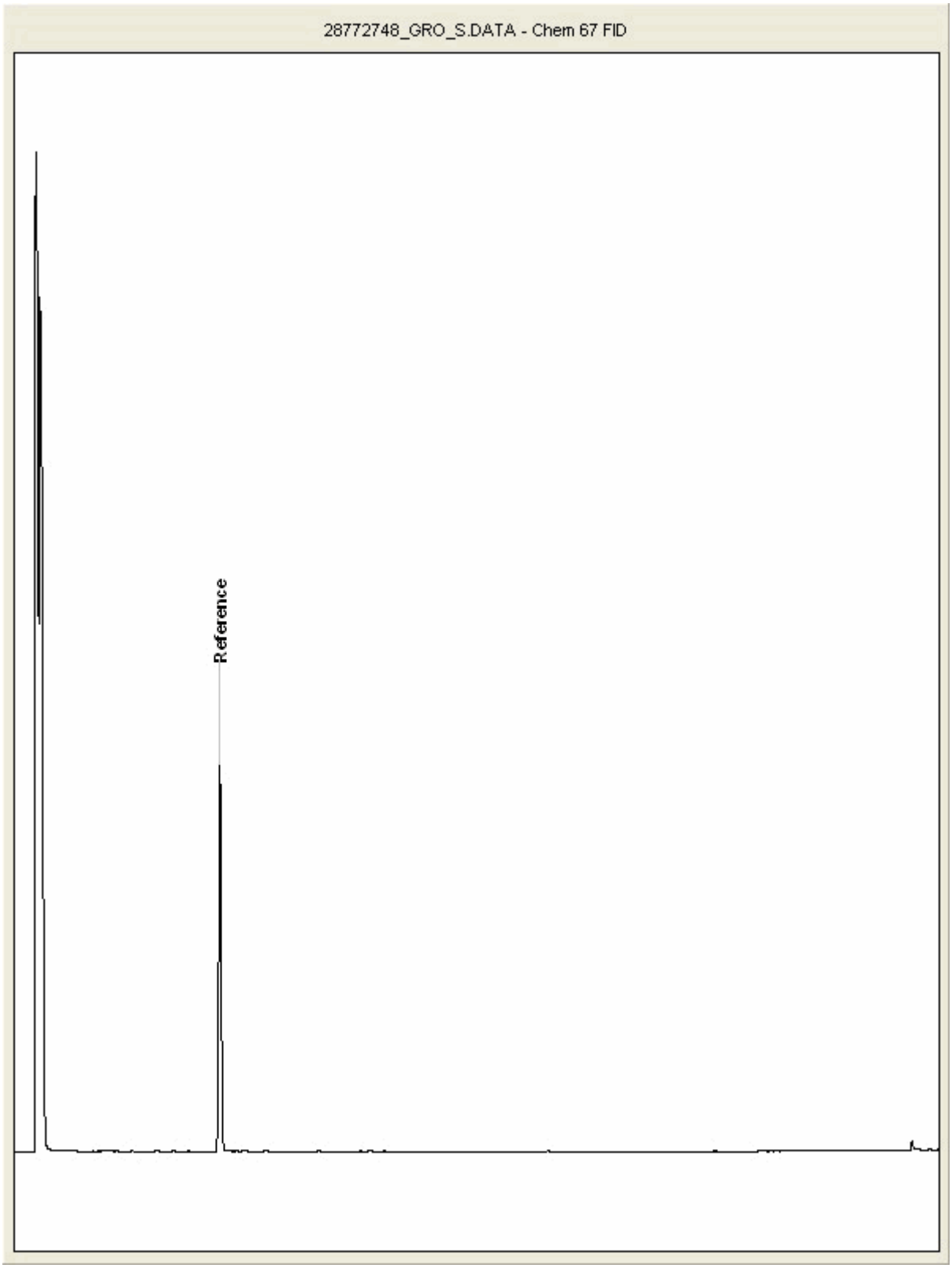


CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Chromatogram

Analysis: GRO by GC-FID (S) **Sample No :** 28772748 **Depth :** 0.70
Sample ID : TP04

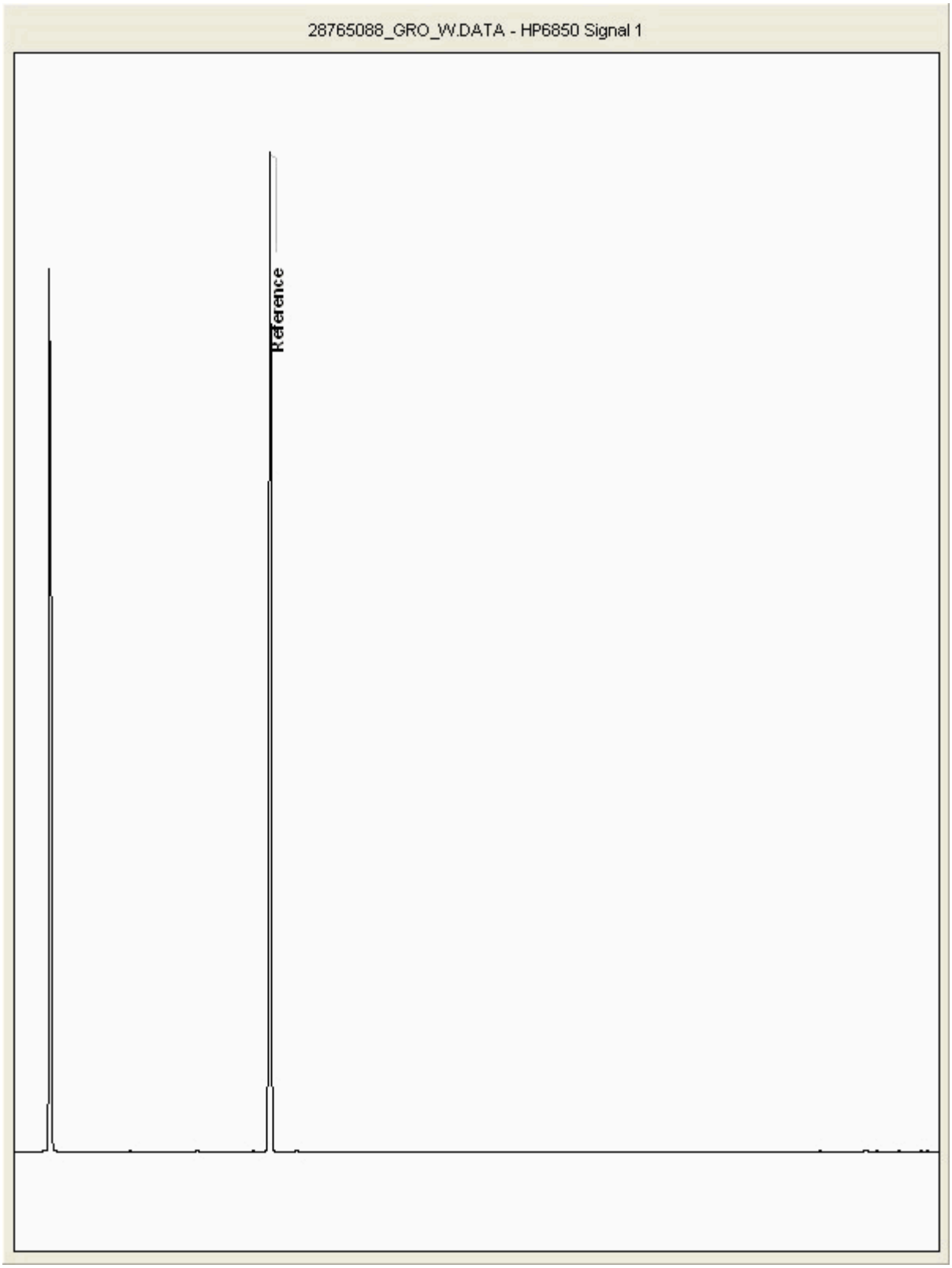


CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Chromatogram

Analysis: GRO by GC-FID (W) **Sample No :** 28765088 **Depth :** 0.00 - 0.00
Sample ID : Entrance

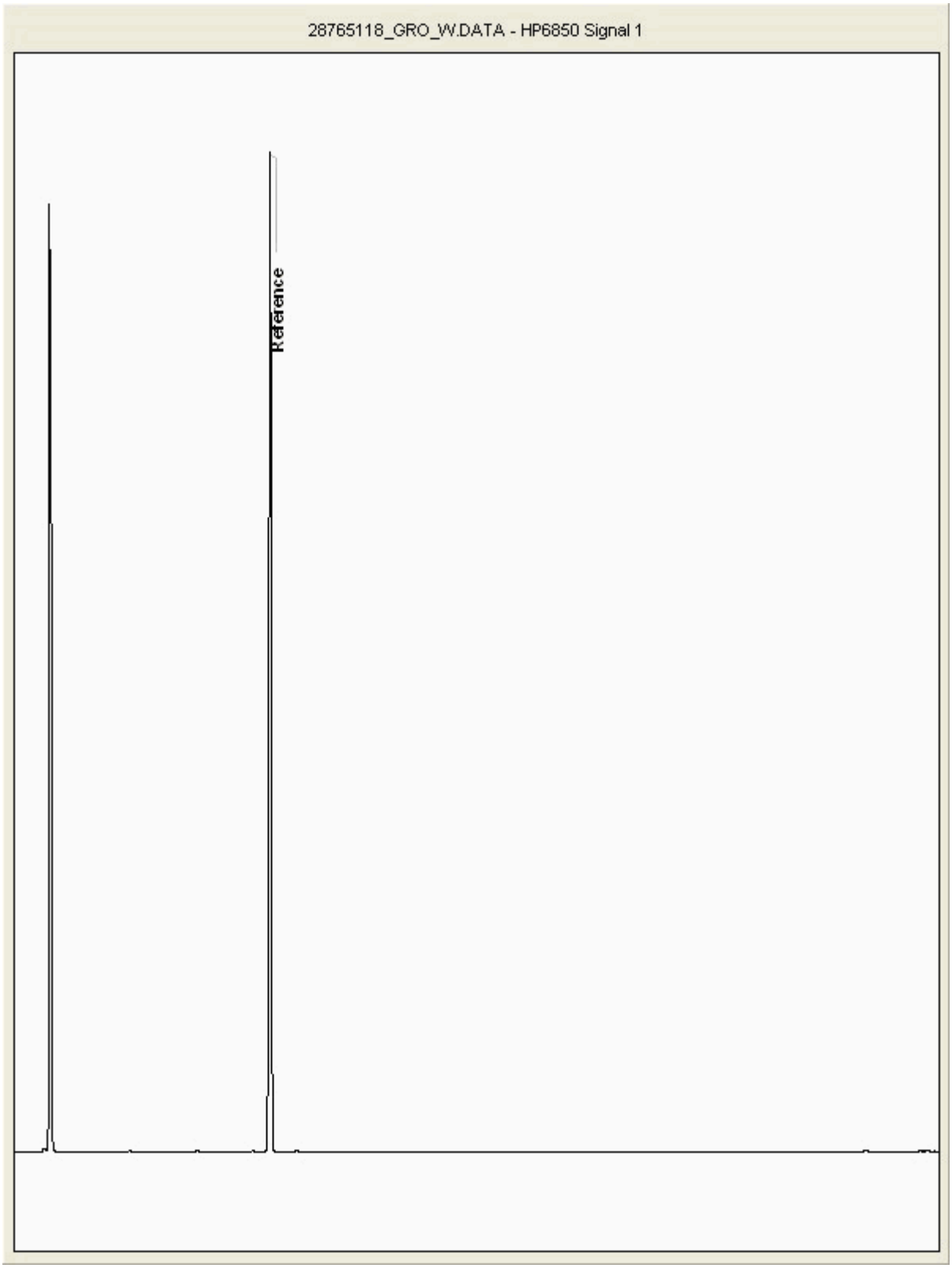


CERTIFICATE OF ANALYSIS

SDG: 231011-65 **Report Number:** 710062 **Superseded Report:** 709240
Client Ref.: GWPR5623 **Location:** Alton Pond, Hampshire

Chromatogram

Analysis: GRO by GC-FID (W) **Sample No :** 28765118 **Depth :** 0.00 - 0.00
Sample ID : Exit



Appendix

General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of 15 days after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as “mixed hydrocarbons”. Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

20. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials andd soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

APPENDIX D: Soil/Water Assessment Criteria

2 The Long Barn, Norton Farm, Selborne Road, Alton, Hampshire GU34 3NB
0333 600 1221 enquiries@groundandwater.co.uk **groundandwater.co.uk**

Registered Office: Kineton House, 31 Horse Fair, Banbury, Oxfordshire OX16 0AE Registered in England No. 07032001

Ground and Water Limited

Soil Guideline Values and Generic Assessment Criteria

The Contaminated Land Regime reflects the UK Government's stated objectives of achieving sustainable development through the 'suitable for use approach'. At preliminary risk assessment stage, risks are evaluated qualitatively. As the site investigation progresses to a generic or detailed quantitative risk assessment, data is collected and assessment criteria are utilised to evaluate whether the contaminants represent an unacceptable risk to the identified receptors.

1. Contaminated Land Exposure Assessment Model (CLEA)

Current United Kingdom risk assessment practice is based on the Contaminated Land Exposure Assessment Model (CLEA).

The CLEA Guidance comprises the following documents:

1) EA Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
2) EA Science Report SC050021/SR3: Updated technical background to the CLEA model.
3) EA CLEA Bulletin (2009).
4) CLEA software version 1.07 (2015)
5) Toxicological reports and SGV technical notes.

The CLEA guidance and tools:

- Do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures;
- Do not cover risks to the environment, such as groundwater, ecosystems or buildings;
- Do not provide a definitive test for telling when human health risks are significant; and
- Are not a legal requirement in assessing land contamination risks. They are not part of the legal regime for Part 2A of the Environmental Protection Act 1990.

The CLEA guidance derives soil concentrations of contaminants above which (in the opinion of the EA) there may be a concern that warrants further investigation. It does not provide a definitive test for establishing that the risk is significant.

1.1. Land-use Scenarios

The CLEA model uses a range of standard land-use scenarios to develop conceptual exposure models outlined in the following sections.

1.1.1. Residential (with home grown produce) (RwHP)

Generic scenario assumes a typical two-storey house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil and indoor dust ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
- Building type is a two-storey small-terraced house.

A sub-set of this land-use is residential apartments with communal landscaped gardens where the consumption of home grown vegetables will not occur. (Residential without homegrown produce (RwoHP)).

1.1.2. Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption. Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours.
- There is no building.

1.1.3. Commercial/Industrial

The generic scenario assumes a typical commercial or light industrial property comprising a three-storey building at which employees spend most time indoors and are involved in office-based or relatively light physical work.

- Critical receptor is a working female adult (aged 16 to 65 years old).
- Exposure duration is a working lifetime of 49 years.
- Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours.
- Building type is a three-storey office (pre 1970).

2. LQM/CIEH Suitable 4 Use Levels (S4UL)

For derivation of these S4UL reference must be made to:

Nathanial, P., McCaffrey, C., Gillet, A., Ogden, R., Nathanial, J., *The LQM/CIEH S4UL's for Human Health Risk Assessment*. **Land Quality Press**. 2015

2.1. S4UL Background

The Land Quality Management/Chartered Institute of Environmental Health (LQM/CIEH) S4UL for a given land use is the concentration of the contaminant in soil at which the predicted daily exposure,

as calculated by the CLEA software, equals the Health Criteria Value. The S4ULs have been derived for substances based on various generic land use and soil organic matter contents.

The final output for each contaminant represents a synthesis of new toxicological (and fate and transport) reviews published since the preparation of the 2nd edition LQM/CIEH GAC's (Nathanial et al., 2009).

In the derivation of LQM/CIEH S4UL's the principles of 'minimal' or 'tolerable' risk enshrined in SR2, which has not been withdrawn, has been maintained.

2.2. S4UL Land-use

S4UL's have been derived for the basic CLEA land-uses, as described in section 1.2, and for two new land uses:

- Public Open Spaces near Residential Housing (POSresi).
- Public Park (POSpark).

2.2.1. Public Open Spaces near Residential Housing (POSresi)

Includes the predominantly grassed areas adjacent to high density housing, the central green area on many 1930's – 1970's housing estates, and smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soils with planting. It is assumed that the close proximity to the place of residence will allow tracking back of soil to occur.

2.2.2. Public Park (POSpark)

An area of open space, usually owned and maintained by the local authority, provided for recreational uses including family visists and picnics, children's play area, informal sporting activities (not a dedicated sports pitch), and dog walking. It is assumed that tracking back of soils into places of residence will be negligible.

The following LQM/CIEH S4Uls (Copyright Land Quality Management Limited) have been reproduced with permission, to the publication number S4UL3072.

3. Category 4 Screening Levels (C4SLs)

In the case of Lead, no SGV or GAC has been published to date. This is likely to be due to the toxicity review that is currently being undertaken by the Environment Agency. In the absence of updated toxicity information the SGV derived using CLEA 1.07 methodology and related toxicity will be used.

The overall objective of the C4SLs research project was to assist the provision of technical guidance in support of Defra's revised Statutory Guidance (SG) for Part 2A of the Environmental Protection Act 1990 (Part 2A) (Defra, 2012a). Specifically, the project aimed to deliver:

- A methodology for deriving C4SLs for four generic land-uses comprising residential, commercial, allotments and public open space; and
- A demonstration of the methodology, via the derivation of C4SLs for six substances – arsenic, benzene, benzo(a)pyrene, cadmium, chromium (VI) and lead.

To help achieve a more targeted approach to identifying and managing contaminated land in relation to the risk (or possibility) of harm to human health, the revised SG presented a new four category

system for considering land under Part 2A, ranging from Category 4, where there is no risk that land poses a significant possibility of significant harm (SPOSH), or the level of risk is low, to Category 1, where the risk that land poses a significant possibility of significant harm (SPOSH) is unacceptably high. More specific guidance on what type of land should be considered as Category 4 (Human Health) is provided in Paragraphs 4.21 and 4.22 of the revised SG, as follows:

> *"4.21 The local authority should consider that the following types of land should be placed into Category 4: Human Health:*
> *(a) Land where no relevant contaminant linkage has been established.*
> *(b) Land where there are only normal levels of contaminants in soil, as explained in Section 3 of this Guidance.*
> *(c) Land that has been excluded from the need for further inspection and assessment because contaminant levels do not exceed relevant generic assessment criteria in accordance with Section 3 of this Guidance, or relevant technical tools or advice that may be developed in accordance with paragraph 3.30 of this Guidance.*
> *(d) Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed in the normal course of their lives).*
>
> *4.22 The local authority may consider that land other than the types described in paragraph 4.21 should be placed into Category 4: Human Health if following a detailed quantitative risk assessment it is satisfied that the level of risk posed is sufficiently low."*

The C4SLs are intended as "relevant technical tools" (in relation to Paragraph 4.21(c)) to help local authorities and others when deciding to stop further assessment of a site, on the grounds that it falls within Category 4 (Human Health).

The Impact Assessment (IA), which accompanied the revised SG (Defra, 2012b) provides further information on the nature and potential role of the C4SLs. Paragraph 47(h) of the IA states that:

> *"The new statutory guidance will bring about a situation where the current SGVs/GACs are replaced with more pragmatic (but still strongly precautionary) Category 4 screening levels (C4SLs) which will provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land."*

A key distinction between the Soil Guideline Values (SGVs) and the C4SLs is the level of risk that they describe. As described by the Environment Agency (2009a):

> *"SGVs are guidelines on the level of long-term human exposure to individual chemicals in soil that, unless stated otherwise, are tolerable or pose a minimal risk to human health."*

The implication of Paragraph 47(h) of the IA is that minimal risk is well within Category 4 and that the C4SLs should describe a higher level of risk which, whilst not minimal, can still be considered low enough to allow a judgement to be made that land containing substances at, or below, the C4SLs would typically fall within Category 4. This reflects Paragraph 4.20 of the revised SG, which states:

> *"4.20 The local authority should not assume that land poses a significant possibility of significant harm if it considers that there is no risk or that the level of risk posed is low. For the purposes of this Guidance, such land is referred to as a "Category 4: Human Health" case. The authority may decide that the land is a Category 4: Human Health case as soon as it considers it has evidence to this effect, and this may happen at any stage during risk assessment including the early stages."*

C4SLs, therefore, should not be viewed as "SPOSH levels" and they should not be used as a legal trigger for the determination of land under Part 2A.

The generic screening values referred to before usually take the form of risk-based Soil Guideline Values (SGVs) or other Generic Assessment Criteria (GACs) that are most typically derived using the Environment Agency's Contaminated Land Exposure Assessment (CLEA) model, as described in the Environment Agency's SR2, SR3 and SR7 reports (EA, 2009b & c; EA, 2008). It is anticipated that C4SLs will be used in a similar manner; as generic screening criteria that can be used within a GQRA, albeit describing a higher level of risk than the SGVs.

The suggested approach to the development of C4SLs consists of the retention and use of the CLEA framework, modified according to considerations of the underlying science within the context of Defra's policy objectives relating to the revised SG. Within this context, it is suggested that the development of C4SLs may be achieved in one of three ways, namely:

- By modifying the toxicological parameters used within CLEA (while maintaining current exposure parameters);
- By modifying the exposure parameters embedded within CLEA (while maintaining current toxicological "minimal risk" interpretations); and
- By modifying both toxicological and exposure parameters.

There is also a suggested check on "other considerations" (e.g., background levels, epidemiological data, sources of uncertainty) within the approach, applicable to all three options.

It is suggested that a new term is defined for the toxicological guidance values associated with the derivation of C4SLs – a Low Level of Toxicological Concern (LLTC). A LLTC should represent an intake of low concern that remains suitably protective of health, and definitely does not approach an intake level that could be defined as SPOSH.

4. CL:AIRE Generic Assessment Criteria (GAC)

For derivation of the CL:AIRE Generic Assessment Criteria (GAC) reference should be made to the following report:

> CL:AIRE, *The Soil Generic Assessment Criteria for Human Health Risk Assessment.* **Contaminated Land: Applications in the Real Environment**. 2009.

Within this report, Contaminated Land: Applications in Real Environments (CL:AIRE) provided Generic Assessment Criteria (GAC) in accordance with the CLEA software and the principles outlined previously for a further 35 contaminants sometimes encountered on land affected by contamination.

5. SoBRA Acute GAC

The Society of Brownfield Risk Assessment (SoBRA) identified that most human health risk assessments focus on the chronic risks arising from long-term exposure to specific substances. As chronic risks often occur at lower doses than acute risks, they are often the key drivers, however, in some instances the acute dose may also be an important consideration within risk assessments.

The methodology for deriving the acute GAC were related to two distinct receptor groups:

- Members of the public, where the 'critical' receptor for this group will typically be a female child, which is consistent with CLEA residential and Public Open Space/allotments land-uses;
- Workers involved with excavations. The critical receptor for this group is assumed to be a female working adult, without the use of PPE.

The acute GACs relate to short term exposure of high concentrations of a substance that lead to acute effects. They are not considered to be average exposures across a specific / defined area. As a result, the GACs should be normally be compared with the maximum likely concentration that the individual may be exposed to, and not the average concentration within a specific area.

The SoBRA acute GAC will primarily be used for contaminants that do not currently have any GAC, most notably Cyanide.

6. Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a DQRA may be undertaken to develop site specific values for relevant soil contaminants.

- Establishing the plausibility that generic exposure pathways exist in practice by measurement and observation.
- Developing more accurate parameters using site data.

7. Phytotoxicity

CLEA guidance only addresses human health toxicity; assessment of plant toxicity (phytotoxicity) is based on threshold trigger values obtained from the following source:

- BS3882:2015 – *Specification for Topsoil*

The trigger values are relevant only to those contaminants, where present in excess, have the potential to inhibit plant growth, or kill plants (Cu, Ni and Zn). The criteria have been based on a wide range of planting that are common within a multi-purpose topsoil.

8. Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) addressed the statistical treatment of test results and their comparison to Soil Guideline Values.

Consideration must be given to the appropriate area of land to be considered termed the critical averaging area.

For a communal open space or commercial land-use, the critical averaging area will depend on the proposed layout. For a residential use with private gardens the averaging area is the individual plot.

It may be appropriate to compare the upper 95th percentile concentration with the Soil Guideline Value, subject to applying a statistical test to establish that the range of concentrations are reasonably consistent and belonging to the same underlying distribution of data.

CL:AIRE published guidance in 2020, *Guidance in comparing soil contamination data with a critical concentration,* superseding the CL:AIRE/CIEH 2008 report of the same name. The guidance provides ways to assist land contamination stakeholders to apply statistical methods to their data to enable decisions under the legislative framework; either planning system or Part 2A of the Environmental Protection Act 1990.

The use of the statistical tests should only be applied if the following statements are valid for the datasets:

- Averaging areas, as well as the smallest area of concern have been identified on the basis of the CSM, including the desk study and/or the site walkover;
- The sample locations were chosen using a simple random, stratified random or stratified systematic (square, herringbone or triangular grid) sampling pattern, rather than being targeted to locations suspected of being contaminated;
- The sample locations are relatively evenly spread across the area and are not clustered, to avoid giving undue weight to some parts of the site over others in the calculated statistics;
- The analyses do not suggest a hotspot or outlier of contamination that should be treated as a separate zone. This has been established by a histogram and/or a names statistical test;
- The sample locations are all taken from one population (i.e. the same material);
- Where an averaging zone encompasses several averaging areas, analyses do not show a spatial trend or other spatial pattern across that zone; and
- The number of samples has been shown to be sufficient for a statistical analysis.

Any included statistical spreadsheet is based on an in-house method of statistical analysis, in line with those outlined within the CL:AIRE guidance (2020).

Treatment of Hot-Spots

- A statistical test is applied to establish whether the data is a part of a single set, or whether data outliers are present.
- Provided that the data is based on random sampling and no distinct contamination source was present at the sampling location, the hot-spot(s) may be excluded and the mean of the remaining data assessed.

9. Ground and Water Limited Soil Assessment Criteria

The Soil Assessment Criteria used in the preparation of the Generic Quantitative Risk Assessment are tabulated in the following pages, where the source of each has been outlined in the previous sections.

9.1. Inorganics

SoBRA – Acute Generic Assessment Criteria						
Determinand	**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**	**POSresi (mg/kg)**	**POSpark (mg/kg)**
Cyanide	24	24	24	1400	24	24

9.2. Metals

C4SL Low Level of Toxicological Concern						
Determinand	**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**	**POSresi (mg/kg)**	**POSpark (mg/kg)**
Lead	< 200	< 310	< 80	< 2300	< 630	< 1300

LQM/CIEH Suitable 4 Use Levels – Metals and Semi-metals						
Determinand	**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**	**POSresi (mg/kg)**	**POSpark (mg/kg)**
Arsenic	37	40	43	640	79	170
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11000	45	240000	21000	46000
Cadmium	11	85	1.9	190	120	532
Chromium (III)	910	910	18000	8600	1500	33000
Chromium (VI)	6	6	1.8	33	7.7	220
Copper	2400	7100	520	68000	12000	44000
Elemental Mercury	1.2	1.2	21	58	16	30
Inorganic Mercury	40	56	19	1100	120	240
Methylmercury	11	15	6	320	40	68
Nickel	130	180	53	980	230	800
Selenium	250	430	88	12000	1100	1800
Vanadium	410	1200	91	9000	2000	5000
Zinc	3700	40000	620	730000	81000	170000

Phytotoxicity (Harmful to Plants) Threshold Trigger Values			
Determinand	**Soil pH < 6.0 (mg/kg)**	**Soil pH 6.0 – 7.0 (mg/kg)**	**Soil pH > 7.0 (mg/kg)**
Copper	100	135	200
Nickel	60	75	110
Zinc	200	200	300
Notes: BS3882:2015 – *Specification for Topsoil*. Based on a wide range of common plants that will be exposed to multi-purpose topsoil. Toxicity of contaminant may also be impacted by pH of soils. Site observation of plant vitality may give additional guidance.			

CL:AIRE Soil Generic Assessment Criteria				
Determinand	**Residential (mg/kg)**	**Residential without plant uptake (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**
Antimony	ND	550	ND	7500
Barium	ND	1300	ND	22000
Molybdenum	ND	670	ND	17000
ND – Not derived				

9.3. Total Petroleum Hydrocarbons (TPHs)

9.3.1. BTEX Compounds

LQM/CIEH Suitable 4 Use Levels – BTEX Compounds							
Determinand	**Soil Organic Matter**	**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**	**POSresi (mg/kg)**	**POSpark (mg/kg)**
Benzene	1.0% SOM	0.087	0.38	0.017	27	72	90
	2.5% SOM	0.170	0.70	0.034	47	72	100
	6.0% SOM	0.370	1.40	0.075	90	73	110
Toluene	1.0% SOM	130	880	22	56000	56000	87000
	2.5% SOM	290	1900	51	110000	56000	95000
	6.0% SOM	660	3900	120	180000	56000	100000
Ethylbenzene	1.0% SOM	47	83	16	5700	24000	17000
	2.5% SOM	110	190	39	13000	24000	22000
	6.0% SOM	260	440	91	27000	25000	27000
o-Xylene	1.0% SOM	60	88	28	6600	41000	17000
	2.5% SOM	140	210	67	15000	42000	24000
	6.0% SOM	330	480	160	33000	43000	33000
m-Xylene	1.0% SOM	59	82	31	6200	41000	17000
	2.5% SOM	140	190	74	14000	42000	24000
	6.0% SOM	320	450	170	31000	43000	33000
p-Xylene	1.0% SOM	56	79	29	5900	41000	17000
	2.5% SOM	130	180	69	14000	42000	23000
	6.0% SOM	310	430	160	30000	43000	31000
SOM = Soil Organic Matter Content (%)							

9.3.2. Total Petroleum Hydrocarbons – Aliphatic

LQM/CIEH Suitable 4 Use Levels For TPH							
Aliphatic		**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**	**POSresi (mg/kg)**	**POSpark (mg/kg)**
EC 5-6	1.0% SOM	42	42	730	3,200 (304) [sol]	570,000 (304) [sol]	95,000 (304) [sol]
	2.5% SOM	78	78	1,700	5,900 (558) [sol]	590,000	130,000 (558) [sol]
	6.0% SOM	160	160	3,900	12,000 (1150) [sol]	600,000 (1150)[sol]	180,000 (1150) [sol]
EC >6-8	1.0% SOM	100	100	2,300	7,800 (144) [sol]	600,000	150,000 (144) [sol]
	2.5% SOM	230	230	5,600	17,000 (322) [sol]	610,000	220,000 (322) [sol]
	6.0% SOM	530	530	13,000	40,000 (736) [sol]	620,000	320,000 (736) [sol]
EC >8-10	1.0% SOM	27	27	320	2,000 (78) [sol]	13,000	14,000 (78) [sol]
	2.5% SOM	65	65	770	4,800 (118) [vap]	13,000	18,000 (118) [vap]
	6.0% SOM	150	150	1,700	11,000 (451) [vap]	13,000	21,000 (451) [vap]
EC >10-12	1.0% SOM	130 (48) [vap]	130 (48) [vap]	2,200	9,700 (48) [sol]	13,000	21,000 (48) [sol]
	2.5% SOM	330 (118) [vap]	330 (118) [vap]	4,400	23,000 (118) [vap]	13,000	23,000 (118) [vap]
	6.0% SOM	760 (283) [vap]	760 (283) [vap]	7,300	47,000 (283) [vap]	13,000	24,000 (283) [vap]
EC >12-16	1.0% SOM	1,100 (24) [sol]	1,100 (24) [sol]	11,000	59,000 (24) [sol]	13,000	25,000 (24) [sol]
	2.5% SOM	2,400 (59) [sol]	2,400 (59) [sol]	13,000	82,000 (59) [sol]	13,000	25,000 (59) [sol]
	6.0% SOM	4,300 (142) [sol]	4,400 (142) [sol]	13,000	90,000 (142) [sol]	13,000	26,000 (142) [sol]
EC >16-35	1.0% SOM	65,000 (8.48) [sol]	65,000 (8.48) [sol]	260,000	1,600,000	250,000	450,000
	2.5% SOM	92,000 (21) [sol]	92,000 (21) [sol]	270,000	1,700,000	250,000	480,000
	6.0% SOM	110,000	110,000	270,000	1,800,000	250,000	490,000
EC >35-44	1.0% SOM	65,000 (8.48) [sol]	65,000 (8.48) [sol]	260,000	1,600,000	250,000	450,000
	2.5% SOM	92,000 (21) [sol]	92,000 (21) [sol]	270,000	1,700,000	250,000	480,000
	6.0% SOM	110,000	110,000	270,000	1,800,000	250,000	490,000

SOM = Soil Organic Matter Content (%)

[vap] – GAC presented exceeds the vapour saturation limit, which is presented in brackets.

[sol] – GAC presented exceeds the soil saturation limit, which is presented in brackets.

9.3.3. Total Petroleum Hydrocarbons – Aromatic

LQM/CIEH Suitable 4 Use Levels For TPH							
Aromatic		**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**	**POSresi (mg/kg)**	**POSpark (mg/kg)**
EC 5-7 (Benzene)	1.0% SOM	70	370	13	26,000 (1220) [sol]	56,000	76,000 (1220 [sol]
	2.5% SOM	140	690	27	46,000 (2260) [sol]	56,000	84,000 (2260) [sol]
	6.0% SOM	300	1,400	57	86,000 (4710) [sol]	56,000	92,000 (4710) [sol]
EC >7-8 (Toluene)	1.0% SOM	130	860	22	56,000 (869) [vap]	56,000	87,000 (869) [sol]
	2.5% SOM	290	1,800	51	110,000 (1920) [sol]	56,000	95,000 (1920) [sol]
	6.0% SOM	660	3,900	120	180,000 (4360) [vap]	56,000	100,000 (4360) [vap]
EC >8-10	1.0% SOM	34	47	8.6	3,500 (613) [vap]	5,000	7,200 (613) [vap]
	2.5% SOM	83	110	21	8,100 (1500) [vap]	5,000	8,500 (1500) [vap]
	6.0% SOM	190	270	51	17,000 (3850) [vap]	5,000	9,300 (3580) [vap]
EC >10-12	1.0% SOM	74	250	13	16,000 (364) [sol]	5,000	9,200 (364) [sol]
	2.5% SOM	180	590	31	28,000 (899) [sol]	5,000	9,700 (889) [sol]
	6.0% SOM	380	1,200	74	34,000 (2150) [sol]	5,000	10,000
EC >12-16	1.0% SOM	140	1,800	23	36,000 (169) [sol]	5,100	10,000
	2.5% SOM	330	2,300 (419) [sol]	57	37,000	5,100	10,000
	6.0% SOM	660	2,500	130	38,000	5,000	10,000
EC >16-21	1.0% SOM	260	1,900	46	28,000	3,800	7,600
	2.5% SOM	540	1,900	110	28,000	3,800	7,700
	6.0% SOM	930	1,900	260	28,000	3,800	7,800
EC >21-35	1.0% SOM	1,100	1,900	370	28,000	3,800	7,800
	2.5% SOM	1,500	1,900	820	28,000	3,800	7,800
	6.0% SOM	1,700	1,900	1,600	28,000	3,800	7,900
EC >35-44	1.0% SOM	1,100	1,900	370	28,000	3,800	7,800
	2.5% SOM	1,500	1,900	820	28,000	3,800	7,800
	6.0% SOM	1,700	1,900	1,600	28,000	3,800	7,900
EC >44-70	1.0% SOM	1,600	1,900	1,200	28,000	3,800	7,800
	2.5% SOM	1,800	1,900	2,100	28,000	3,800	7,800
	6.0% SOM	1,900	1,900	3,000	28,000	3,800	7,900

SOM = Soil Organic Matter Content (%)

[vap] – GAC presented exceeds the vapour saturation limit, which is presented in brackets.

[sol] – GAC presented exceeds the soil saturation limit, which is presented in brackets.

9.4. Polycyclic Aromatic Hydrocarbons (PAHs)

LQM/CIEH Suitable 4 Use Levels For Polycyclic Aromatic Hydrocarbons (PAHs)							
Determinands		**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**	**POSresi (mg/kg)**	**POSpark (mg/kg)**
Acenapthene	1.0% SOM	210	3,000 (57.0) [sol]	34	84,000(57.0) [sol]	15,000	29,000
	2.5% SOM	510	4,700(141) [sol]	85	97,000(141) [sol]	15,000	30,000
	6.0% SOM	1100	6,000(336) [sol]	200	100,000	15,000	30,000
Acenapthylene	1.0% SOM	170	2,900(86.1) [sol]	28	83,000(86.1) [sol]	15,000	29,000
	2.5% SOM	420	4,600(212) [sol]	69	97,000(212) [sol]	15,000	30,000
	6.0% SOM	920	6,000(506) [sol]	160	100,000	15,000	30,000
Anthracene	1.0% SOM	2,400	31,000(1.17) [vap]	380	520,000	74,000	150,000
	2.5% SOM	5,400	35,000	950	540,000	74,000	150,000
	6.0% SOM	11,000	37,000	2,200	540,000	74,000	150,000
Benzo(a)anthracene	1.0% SOM	7.20	11	2.90	170	29	49
	2.5% SOM	11	14	6.50	170	29	56
	6.0% SOM	13	15	13	180	29	62
Benzo(a)pyrene	1.0% SOM	2.20	3.20	0.97	35	5.70	11
	2.5% SOM	2.70	3.20	2.00	35	5.70	12
	6.0% SOM	3.00	3.20	3.50	36	5.70	13
Benzo(b)flouranthene	1.0% SOM	2.60	3.90	0.99	44	7.10	13
	2.5% SOM	3.30	4.00	2.10	44	7.20	15
	6.0% SOM	3.70	4.00	3.90	45	7.20	16
Benzo(ghi)perylene	1.0% SOM	320	360	290	3,900	640	1,400
	2.5% SOM	340	360	470	4,000	640	1,500
	6.0% SOM	350	360	640	4,000	640	1,600
Benzo(k)flouranthene	1.0% SOM	77	110	37	1,200	190	370
	2.5% SOM	93	110	75	1,200	190	410
	6.0% SOM	100	110	130	1,200	190	440
Chrysene	1.0% SOM	15	30	4.10	350	57	93
	2.5% SOM	22	31	9.40	350	57	110
	6.0% SOM	27	32	19	350	57	120
Dibenzo(ah)anthracene	1.0% SOM	0.24	0.31	0.14	3.50	0.57	1.10
	2.5% SOM	0.28	0.32	0.27	3.50	0.57	1.30
	6.0% SOM	0.30	0.32	0.43	3.60	0.58	1.40
Flouranthene	1.0% SOM	280	1,500	52	23,000	3,100	6,300
	2.5% SOM	560	1,600	130	23,000	3,100	6,300
	6.0% SOM	890	1,600	290	23,000	3,100	6,300
Flourene	1.0% SOM	170	2,800 (30.9) [sol]	27	63,000(30.9) [sol]	9,900	20,000
	2.5% SOM	400	3,800(76.5) [sol]	67	68,000	9,900	20,000
	6.0% SOM	860	4,500(183) [sol]	160	71,000	9,900	20,000
Indeno(123-cd)pyrene	1.0% SOM	27	45	9.50	500	82	150
	2.5% SOM	36	46	21	510	82	170
	6.0% SOM	41	46	39	510	82	180
Napthalene	1.0% SOM	2.30	2.6	4.10	190 (76.4) [sol]	4,900	1,200(76.4) [sol]
	2.5% SOM	5.60	5.6	10	460 (183) [sol]	4,900	1,900(183) [sol]
	6.0% SOM	13	13	24	1,100 (432) [sol]	4,900	3,000
Phenanthrene	1.0% SOM	95	1,300(183) [sol]	15	22,000	3,100	6,200
	2.5% SOM	220	1,500	38	22,000	3,100	6,200
	6.0% SOM	440	1,500	90	23,000	3,100	6,300
Pyrene	1.0% SOM	620	3,700	110	54,000	7,400	15,000
	2.5% SOM	1200	3,800	270	54,000	7,400	15,000
	6.0% SOM	2000	3,800	620	54,000	7,400	15,000
Coal Tar (Benzo(a)pyrene used as marker compound)	1.0% SOM	0.79	1.2	0.32	15	2.20	4.40
	2.5% SOM	0.98	1.2	0.67	15	2.20	4.70
	6.0% SOM	1.10	1.2	1.20	15	2.20	4.80

SOM = Soil Organic Matter Content (%)

[vap] – GAC presented exceeds the vapour saturation limit, which is presented in brackets.

[sol] – GAC presented exceeds the soil saturation limit, which is presented in brackets.

9.5. Volatile and Semi-volatile Organic Compounds

LQM CIEH General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds							
Determinands		**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**	**POSresi (mg/kg)**	**POSpark (mg/kg)**
Chloroalkanes & alkenes							
1,2 Dichloroethane	1.0% SOM	0.11	0.16	0.054	12	300	300
	2.5% SOM	0.18	0.24	0.100	17	310	330
	6.0% SOM	0.31	0.41	0.190	29	310	380
1,1,2,2 Tetrachloroethane	1.0% SOM	1.60	3.90	0.41	270	1,400	1,800
	2.5% SOM	3.40	8.00	0.89	550	1,400	2,100
	6.0% SOM	7.50	17	2.00	1,100	1,400	2,300
1,1,1,2 Tetrachloroethane	1.0% SOM	1.20	1.50	0.79	110	1,400	1,500
	2.5% SOM	2.80	3.50	1.90	250	1,400	1,800
	6.0% SOM	6.40	8.20	4.40	560	1,400	2,100
Tetrachloroethene	1.0% SOM	0.31	0.32	2.0	24	3,200	1,400
	2.5% SOM	0.70	0.71	4.8	55	3,300	1,900
	6.0% SOM	1.60	1.60	11.0	130	3,400	2,500
1,1,1 Trichloroethane	1.0% SOM	8.80	9.00	48	660	140,000	57,000 [vap](1425)
	2.5% SOM	18	18	110	1,300	140,000	76,000 [vap](2915)
	6.0% SOM	39	40	240	3,000	140,000	100,000 [vap] (6392)
Tetrachloromethene	1.0% SOM	0.026	0.026	0.45	2.90	890	190
	2.5% SOM	0.056	0.056	1.00	6.30	920	270
	6.0% SOM	0.130	0.130	2.40	14	950	400
Trichloroethene	1.0% SOM	0.0093	0.0097	0.0320	0.73	76	41
	2.5% SOM	0.0200	0.0200	0.0720	1.50	78	54
	6.0% SOM	0.0430	0.0450	0.1600	3.40	79	69
Trichloromethane	1.0% SOM	0.91	1.20	0.42	99	2,500	2,600
	2.5% SOM	1.70	2.10	0.83	170	2,500	2,800
	6.0% SOM	3.40	4.20	1.70	350	2,500	3,100
Vinyl Chloride	1.0% SOM	0.0064	0.0150	0.0017	1.1	7.8	18
	2.5% SOM	0.0100	0.0190	0.0031	1.4	7.8	19
	6.0% SOM	0.0170	0.0290	0.0058	2.2	7.8	19
Explosives							
2,4,6 Trinitrotoluene	1.0% SOM	1.60	65	0.24	1,000	130	260
	2.5% SOM	3.70	66	0.58	1,000	130	270
	6.0% SOM	8.10	66	1.40	1,000	130	270
RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane)	1.0% SOM	120	13,000	17	210,000	26,000	49,000(18.7)[sol]
	2.5% SOM	250	13,000	38	210,000	26,000	51,000
	6.0% SOM	540	13,000	85	210,000	27,000	53,000
HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)	1.0% SOM	5.70	67,00	0.86	110,000	13,000	23,000(0.35)[vap]
	2.5% SOM	13	67,00	1.90	110,000	13,000	23,000(0.39)[vap]
	6.0% SOM	26	67,00	3.90	110,000	13,000	24,000(0.48)[vap]
Atrazine	1.0% SOM	3.30	610	0.50	9,300	1,200	2,300
	2.5% SOM	7.60	620	1.20	9,400	1,200	2,400
	6.0% SOM	17.40	620	2.70	9,400	1,200	2,400

[vap] – GAC presented exceeds the vapour saturation limit, which is presented in brackets.
[sol] – GAC presented exceeds the soil saturation limit, which is presented in brackets.

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

LQM CIEH General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds							
Determinands		**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**	**POSresi (mg/kg)**	**POSpark (mg/kg)**
Pesticides							
Aldrin	1.0% SOM	5.70	7.30	3.20	170	18	30
	2.5% SOM	6.60	7.40	6.10	170	18	31
	6.0% SOM	7.10	7.50	9.60	170	18	31
Dieldrin	1.0% SOM	0.97	7.00	0.17	170	18	30
	2.5% SOM	2.00	7.30	0.41	170	18	30
	6.0% SOM	3.50	7.40	0.96	170	18	31
Dichlorvos	1.0% SOM	0.032	6.40	0.0049	140	16	26
	2.5% SOM	0.066	6.50	0.0100	140	16	26
	6.0% SOM	0.140	6.60	0.0220	140	16	27
Alpha - Endosulfan	1.0% SOM	7.40	160(0.003)[vap]	1.20	5,600(0.003)[vap]	1,200	2,400
	2.5% SOM	18	280(0.007)[vap]	2.90	7,400(0.007)[vap]	1,200	2,400
	6.0% SOM	41	410(0.016)[vap]	6.80	8,400(0.016)[vap]	1,200	2,400
Beta - Endosulfan	1.0% SOM	7.00	190(0.00007)[vap]	1.10	6,300(0.00007)[vap]	1,200	2,400
	2.5% SOM	17	320(0.0002)[vap]	2.70	7,800(0.0002)[vap]	1,200	2,400
	6.0% SOM	39	440(0.0004)[vap]	6.40	8700	1,200	2,500
Alpha - Hexachlorocyclohexanes	1.0% SOM	0.23	6.90	0.035	170	24	47
	2.5% SOM	0.55	9.20	0.087	180	24	48
	6.0% SOM	1.20	11	0.210	180	24	48
Beta - Hexachlorocyclohexanes	1.0% SOM	0.085	3.70	0.013	65	8.10	15
	2.5% SOM	0.200	3.80	0.032	65	8.10	15
	6.0% SOM	0.460	3.80	0.077	65	8.10	16
Gamma - Hexachlorocyclohexanes	1.0% SOM	0.06	2.90	0.0092	67	8.2	14
	2.5% SOM	0.14	3.30	0.0230	69	8.2	15
	6.0% SOM	0.33	3.50	0.0540	70	8.2	15
Chlorobenzenes							
Chlorobenzene	1.0% SOM	0.46	0.46	5.90	56	11,000	1,300(675)[sol]
	2.5% SOM	1.00	1.00	14	130	13,000	2,000(1520)[sol]
	6.0% SOM	2.40	2.40	32	290	14,000	2,900
1,2-Dichlorobenzene	1.0% SOM	23	24	94	2,000 (571) [sol]	90,000	24,000(571)[sol]
	2.5% SOM	55	57	230	4,800 (1370) [sol]	95,000	36,000(1370)[sol]
	6.0% SOM	130	130	540	11,000 (3240) [sol]	98,000	51,000(3240)[sol]
1,3-Dichlorobenzene	1.0% SOM	0.40	0.44	0.25	30	300	390
	2.5% SOM	1.00	1.10	0.60	73	300	440
	6.0% SOM	2.30	2.50	1.50	170	300	470
1,4-Dichlorobenzene	1.0% SOM	61	61	15	4,400 (224)[vap]	17,000[g]	36,000 (224)[vap]
	2.5% SOM	150	150	37	10,000 (540)[vap]	17,000[g]	36,000 (540)[vap]
	6.0% SOM	350	350	88[g]	25,000 (1280)[vap]	17,000[g]	36,000 (1280)[vap]
1,2,3,-Trichlorobenzene	1.0% SOM	1.50	1.50	4.70	102	1,800	770(134)[vap]
	2.5% SOM	3.60	3.70	12	250	1,800	1,100(330)[vap]
	6.0% SOM	8.60	8.80	28	590	1,800	1,600(789)[vap]
1,2,4,-Trichlorobenzene	1.0% SOM	2.60	2.60	55	220	15,000	1,700(318)[vap]
	2.5% SOM	6.40	6.40	140	530	17,000	2,600(786)[vap]
	6.0% SOM	15	15	320	1,300	19,000	4,000(1880)[vap]
1,3,5,-Trichlorobenzene	1.0% SOM	0.33	0.33	4.70	23	1,700	380(36.7)[vap]
	2.5% SOM	0.81	0.81	12	55	1,700	590(90.8)[vap]
	6.0% SOM	1.90	1.90	140	130	1,800	860(217)[vap]

[vap] – GAC presented exceeds the vapour saturation limit, which is presented in brackets.
[sol] – GAC presented exceeds the soil saturation limit, which is presented in brackets.

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

LQM CIEH General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds							
Determinands		**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**	**POSresi (mg/kg)**	**POSpark (mg/kg)**
Chlorobenzenes (cont.)							
1,2,3,4,- Tetrachlorobenzene	1.0% SOM	15	24	4.40	1,700(122)^{vap}	830	1,500(122)^{vap}
	2.5% SOM	36	56	11	3,080(304)^{vap}	830	1,600
	6.0% SOM	78	120	26	4,400(728)^{vap}	830	1,600
1,2,3,5,- Tetrachlobenzene	1.0% SOM	0.66	0.75	0.38	49(39.4)^{vap}	78	110(39)^{vap}
	2.5% SOM	1.60	1.90	0.90	120(98.1)^{vap}	79	120
	6.0% SOM	3.70	4.30	2.20	240(235)^{vap}	79	130
1,2,4, 5,- Tetrachlobenzene	1.0% SOM	0.33	0.73	0.06	42(19.7)^{sol}	13	25
	2.5% SOM	0.77	1.70	0.16	72(49.1)^{sol}	13	26
	6.0% SOM	1.60	3.50	0.37	96	13	26
Pentachlrobenzene	1.0% SOM	5.80	19	1.20	640(43.0)^{sol}	100	190
	2.5% SOM	12	30	3.10	770(107)^{sol}	100	190
	6.0% SOM	22	38	7.00	830	100	190
Hexachlorobenzene	1.0% SOM	1.80(0.20)^{vap}	4.10 (0.20)^{vap}	0.47	110(0.20)^{vap}	16	30
	2.5% SOM	3.30(0.50)^{vap}	5.70 (0.50)^{vap}	1.10	120	16	30
	6.0% SOM	4.90	6.70 (1.2)^{vap}	2.50	120	16	30
Phenols & Chlorophenols							
BTEX	1.0% SOM	280	750	66	760^{dir}(31,000)	760^{dir}(11,000)	760^{dir}(8,600)
	2.5% SOM	550	1,300	140	1,500^{dir}(35,000)	1,500^{dir}(11,000)	1,500^{dir}(9,700)
	6.0% SOM	1100	2,300	280	3,200^{dir}(37,000)	3,200^{dir}(11,000)	3,200^{dir}(11,000)
Chlorophenols (4 Congeners)	1.0% SOM	0.87	94	0.13	3,500	620	1,100
	2.5% SOM	2.00	150	0.30	4,000	620	1,100
	6.0% SOM	4.50	210	0.70	4,300	620	1,100
Pentachlorophenols	1.0% SOM	0.22	27(16.4)^{vap}	0.03	400	60	110
	2.5% SOM	0.52	29	0.08	400	60	120
	6.0% SOM	1.20	31	0.19	400	60	120
Others							
Carbon Disulphide	1.0% SOM	0.14	0.14	4.80	11	11,000	1,300
	2.5% SOM	0.29	0.29	10	22	11,000	1,900
	6.0% SOM	0.62	0.62	23	47	12,000	2,700
Hexachloro-1,3-Butadiene	1.0% SOM	0.29	0.32	0.25	31	25	48
	2.5% SOM	0.70	0.78	0.61	68	25	50
	6.0% SOM	1.60	1.80	1.40	120	25	51

^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets.
^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

CL:AIRE General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds					
Determinands		**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**
1,1,2 Trichloroethane	1.0% SOM	0.60	0.88	0.28	94
	2.5% SOM	1.20	1.8	0.61	190
	6.0% SOM	2.70	3.9	1.40	400
1,1-Dichloroethane	1.0% SOM	2.40	2.50	9.20	280
	2.5% SOM	3.90	4.10	17	450
	6.0% SOM	7.40	7.70	35	850
1,1-Dichloroethene	1.0% SOM	0.23	0.23	2.80	26
	2.5% SOM	0.40	0.41	5.60	46
	6.0% SOM	0.82	0.82	12	92
1,2,4-Trimethylbenzene	1.0% SOM	0.35	0.41	0.38	42
	2.5% SOM	0.85	0.99	0.93	99
	6.0% SOM	2.00	2.30	2.20	220
1,2-Dichloropropane	1.0% SOM	0.024	0.024	0.62	3.3
	2.5% SOM	0.042	0.042	1.20	5.9
	6.0% SOM	0.084	0.085	2.60	12
2,4-Dimethylphenol	1.0% SOM	19	210	3.10	16000*
	2.5% SOM	43	410	7.20	24000*
	6.0% SOM	97	730	17	30000*
2,4-Dinitrotoluene	1.0% SOM	1.50	170*	0.22	3700*
	2.5% SOM	3.20	170	0.49	3700*
	6.0% SOM	7.20	170	1.10	3800*
2,6-Dinitrotoluene	1.0% SOM	0.78	78	0.12	1900*
	2.5% SOM	1.70	84	0.27	1900*
	6.0% SOM	3.90	87	0.61	1900*
2-Chloronapthalene	1.0% SOM	3.70	3.80	40	390*
	2.5% SOM	9.20	9.30	98	960*
	6.0% SOM	22	22	230	2200*
Biphenyl	1.0% SOM	66*	220*	14	18000*
	2.5% SOM	160	500*	35	33000*
	6.0% SOM	360	980*	83	48000*
Bis (2-ethylhexyl) phthalate	1.0% SOM	280*	2700*	47*	85000*
	2.5% SOM	610*	2800*	120*	86000*
	6.0% SOM	1100*	2800*	280*	86000*
Bromobenzene	1.0% SOM	0.87	0.91	3.2	97
	2.5% SOM	2.0	2.1	7.6	220
	6.0% SOM	4.7	4.9	18	520
Bromodichloromethane	1.0% SOM	0.016	0.019	0.016	2.1
	2.5% SOM	0.030	0.034	0.032	3.7
	6.0% SOM	0.061	0.070	0.068	7.6
Bromoform	1.0% SOM	2.8	5.2	0.95	760
	2.5% SOM	5.9	11	2.1	1500
	6.0% SOM	13	23	4.6	3100
Butyl benzyl phthalate	1.0% SOM	1400*	42000*	220*	940000*
	2.5% SOM	3300*	44000*	550*	940000*
	6.0% SOM	7200*	44000*	1300*	950000*

*soil concentration above saturation limit

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

CL:AIRE General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds					
Determinands		**RwHP (mg/kg)**	**RwoHP (mg/kg)**	**Allotment (mg/kg)**	**Commercial (mg/kg)**
Chloroethane	1.0% SOM	8.3	8.4	110	960
	2.5% SOM	11	11	200	1300
	6.0% SOM	18	18	380	2100
Chloromethane	1.0% SOM	0.0083	0.0085	0.066	1.0
	2.5% SOM	0.0098	0.0099	0.13	1.2
	6.0% SOM	0.013	0.013	0.23	1.6
***Cis* 1,2 Dichloroethene**	1.0% SOM	0.11	0.12	0.26	14
	2.5% SOM	0.19	0.20	0.50	24
	6.0% SOM	0.37	0.39	1.0	47
Dichloromethane	1.0% SOM	0.58	2.10	0.10	270
	2.5% SOM	0.98	2.80	0.19	360
	6.0% SOM	1.70	4.50	0.34	560
Diethyl Phthalate	1.0% SOM	120*	1800*	19*	150000*
	2.5% SOM	260*	3500*	41*	220000*
	6.0% SOM	570*	6300*	94*	290000*
Di-*n*-butyl phthalate	1.0% SOM	13*	450*	2.00	15000*
	2.5% SOM	31*	450*	5.00	15000*
	6.0% SOM	67*	450*	12	15000*
Di-*n*-octyl phthalate	1.0% SOM	2300*	3400*	940*	89000*
	2.5% SOM	2800*	3400*	2100*	89000*
	6.0% SOM	3100*	3400*	3900*	89000*
Hexachloroethane	1.0% SOM	0.20	0.22	0.27	22*
	2.5% SOM	0.48	0.54	0.67	53*
	6.0% SOM	1.10	1.30	1.60	120*
Isopropylbenzene	1.0% SOM	11	12	32	1400*
	2.5% SOM	27	28	79	3300*
	6.0% SOM	64	67	190	7700*
Methyl *tert*-butyl ether (MTBE)	1.0% SOM	49	73	23	7900
	2.5% SOM	84	120	44	13000
	6.0% SOM	160	220	90	24000
Propylbenzene	1.0% SOM	34	40	34	4100*
	2.5% SOM	82	97	83	9700*
	6.0% SOM	190	230	200	21000*
Styrene	1.0% SOM	8.10	35	1.60	3300*
	2.5% SOM	19	78	3.70	6500*
	6.0% SOM	43	170	8.70	11000*
Total Cresols (2-, 3-, and 4-methylphenol)	1.0% SOM	80	3700	12	160000
	2.5% SOM	180	5400	27	180000*
	6.0% SOM	400	6900	63	180000*
***Trans* 1,2 Dichloroethene**	1.0% SOM	0.19	0.19	0.93	22
	2.5% SOM	0.34	0.35	1.90	40
	6.0% SOM	0.70	0.71	0.24	81
Tributyl tin oxide	1.0% SOM	0.25	1.40	0.042	130*
	2.5% SOM	0.59	3.10	0.100	180*
	6.0% SOM	1.30	5.70	0.240	200*

*soil concentration above saturation limit

Ground and Water Limited

Waters Guideline Values and Generic Assessment Criteria

Land contamination can harm a number of receptors, most notably: human health; drinking water; groundwater; surface water; soils; ecosystems; and buildings/structures. The UK Government's stated objectives of LCRM are to enhance the health and wellbeing of all, whilst adding the economic, ecological and amenity value of the area through dealing with land contamination.

The risk assessment is an iterative process. At preliminary risk assessment stage, risks are evaluated qualitatively. As the site investigation progresses to a generic or detailed quantitative risk assessment, data is collected and assessment criteria are utilised to evaluate whether the contaminants represent an unacceptable risk to the identified receptors.

Based on the identified receptor, there are numerous assessment criteria that can be used, which have been outlined in the subsequent sections.

1. Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015

1.1. Background

Within England and Wales, an appropriate agency must classify the ecological and chemical status of a body of surface water. The agency must also classify the chemical and quantitative status of a body of groundwater. The appropriate agency must review and update the classifications at least every 6 years as and when new data is collected through monitoring programmes. In addition to the classification and as part of the WFD, pollution of surface waters must be controlled by limiting the discharge of priority substances and other substances into surface water.

1.2. Surface Water

In order to aid with the classification, a series of environmental quality standards (EQS) for specific pollutants have been generated. The EQS refer to the dissolved fraction of metals within a water sample, therefore the sample collected must pass through a 0.45µm filter at the time of sampling. A number of metals have a bioavailable threshold and therefore a site specific meta bioavailability assessment should be undertaken.

Where the calculated mean value of a measurement is less than the limit of quantification and the limit of quantification is above the EQS, the result must not be used for determining a failed classification.

For the majority of substances, two values will be included for review; AA and MAC. The Annual Average (AA) is the arithmetic mean of the concentrations measured at different times during the year for each representative point within the water body. When using the Max Allowable Concentration (MAC) values, a statistical analysis may be undertaken to ensure an acceptable level of confidence for determining compliance with the MAC.

1.3. Groundwater

The appropriate agency must apply the threshold values for groundwater (in Table 1, Schedule 5) and, if any value is exceeded, undertake an appropriate investigation to determine whether or not the

applicable conditions for good groundwater chemical status are met. The criteria outlined are designed to be averaged across an aquifer rather than a site specific investigations.

2. The Water Supply (Water Quality) Regulations 2016

The water supply regulations apply in relation to the supply of water to premises for domestic purposes (including for cooking, drinking, food preparation and washing) or for food production purposes, both of which include the intended use for human consumption.

The point of compliance for the water supply is principally the consumers' taps, however, where stated the compliance point is the reservoir or treatment works.

3. World Health Organisation, Petroleum Products in Drinking Water, 2008

The World Health Organisation produced a background document for the development of WHO Guidelines for Drinking-water Quality, specifically relating to petroleum products (WHO/SDE/WSH/05.08/123). Petroleum products are used widely in a range of industrial applications, with the largest quantities used for gasoline, diesel and heating oil.

The difference in chemical and physical properties of each hydrocarbon means that they will behave differently within the environment, where their persistence is dictated by their volatilisation, biodegradation and dissolution within water. As a result of these, the heavier hydrocarbons typically have more persistence. Exposure to human health from petroleum hydrocarbons within drinking water can occur from a short to long-term, however the incident that leads to high concentrations within the drinking water will typically occur in the short term.

Petroleum products are a complicated mix of hundreds of compounds and therefore assessment can be difficult. The TPH-CWG method, developed in the USA, groups the TPH into a series of fractions based on the number of carbon atoms, coupled with the overall structure of the compound. This process enables the TPHs to be split into two distinct groups, aliphatics and aromatics.

4. SoBRA GAC_{gwvap}

Prior to the development of the SoBRA GAC_{gwvap}, there were no formally published UK GAC for the assessment of vapour risk arising from volatile contaminants in groundwater in the UK. The SoBRA groundwater vapour GAC (GAC_{gwvap}) is intended as a conservative screening tool that assessors may choose to use to help assess the long-term (chronic) risks to human health from inhalation of vapours arising from groundwater. They are intended for comparison with measured groundwater concentrations and represent the estimated concentration in groundwater below which the long-term risks to human health from vapour migration and inhalation can be considered low/tolerable, i.e. unlikely to be of concern (for the land use scenarios considered). When used as part of a Generic Quantitative Risk Assessment (GQRA) (which includes consideration of uncertainties) comparison of the GAC_{gwvap} with measured concentrations in groundwater can be used to screen out contaminants as being unlikely to represent an unacceptable risk to humans living or working above the groundwater plume.

The GAC have been derived for two land use scenarios for which the vapour intrusion pathway is likely to require assessment: residential and commercial. Generic assumptions have been made for each land use. These include assumptions about the depth to groundwater, soil type in the unsaturated zone, building dimension and foundation type, and receptor behaviour. The parameter values have been chosen to ensure that the GAC are precautionary for the vast majority of commercial and

residential properties in the UK. However, there may be particular situations where the GAC are not protective, for example where non aqueous phase liquid (NAPL) is present or preferential pathways exist.

5. Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a DQRA may be undertaken to develop site specific values for relevant groundwater contaminants. As part of the EA Remedial Targets Methodology (RTM), a level 3 risk assessment will consider the effect of attenuation between the site and a downgradient receptor or compliance point. For a level 4 risk assessment the appropriateness of assessing dilution in a receiving watercourse or a pumping abstraction borehole will need to be considered.

The RTM also recommends that sensitivity/uncertainty analysis is incorporated into each stage of the assessment.

6. Ground and Water Limited Waters Assessment Criteria

The Waters Assessment Criteria used in the preparation of the Generic Quantitative Risk Assessment are tabulated in the following pages, where the source of each has been outlined in the previous sections.

6.1. Inorganics

Specific Pollutants				
Determinand	**Long Term Fresh water (µg/l)**	**Short Term Fresh water (µg/l)**	**Long Term Salt water (µg/l)**	**Short Term Salt water (µg/l)**
Cyanide	1	5	1	5
Phenol	7.7	46	7.7	46

Drinking Water Standards	
Determinand	**Maximum allowable Concentration at compliance point (µg/l)**
Cyanide	50
pH	6.5 – 9.5

6.2. Metals

Specific Pollutants				
Determinand	**Long Term Fresh water (µg/l)**	**Short Term Fresh water (µg/l)**	**Long Term Salt water (µg/l)**	**Short Term Salt water (µg/l)**
Arsenic	50	-	25	-
Chromium (III)	4.7	32	-	-
Chromium (VI)	3.4	-	0.6	32
Copper	1*	-	3.76	34
Iron	1000	-	1000	-
Manganese	123*	-	-	-
Zinc	10.9*	-	6.8	-

*Site specific bioavailability calculation should be undertaken.

EQS for Priority Substances and other substances

Determinand		AA-EQS Inland surface water (µg/l)	MAC-EQS Inland surface water (µg/l)	AA-EQS Other Surface waters (µg/l)	MAC-EQS Other Surface waters (µg/l)
Cadmium	<40mg/l CaCO3 40 – <50mg/l 50 – <100mg/l 100 – <200mg/l >200mg/l	<0.08 0.08 0.09 0.15 0.25	<0.45 0.45 0.6 0.9 1.5	0.2	-
Lead		1.2	14	1.3	14
Mercury		-	0.07	-	0.07
Nickel		4	34	8.6	34

Threshold Values for Groundwater			
Determinand	Groundwater Impact on Surface Water (µg/l)	Drinking water Protected Area (µg/l)	General Quality of Groundwater Body (µg/l)
Aluminum	-	150	150
Arsenic	25.8 – 106	7.5	7.5
Boron	-	750	-
Cadmium	0.054 – 0.53	3.75	-
Copper	0.516 – 2.12	1500	1500
Lead	0.619 – 2.54	7.5	7.5
Mercury	0.026 – 0.106	0.75	-
Nickel	2.06 – 8.48	15	15
Selenium	-	7.5	-
Zinc	5.62 – 23.1	-	-

Drinking Water Standards	
Determinand	Maximum allowable Concentration at compliance point (µg/l)
Arsenic	10
Cadmium	5
Chromium	50
Copper	2
Lead	10
Mercury	1
Nickel	20

6.3. Total Petroleum Hydrocarbons (TPHs)

6.3.1. BTEX Compounds

Specific Pollutants				
Determinand	Long Term Fresh water (µg/l)	Short Term Fresh water (µg/l)	Long Term Salt water (µg/l)	Short Term Salt water (µg/l)
Toluene	74	380	74	370

EQS for Priority Substances and other substances				
Determinand	AA-EQS Inland surface water (µg/l)	MAC-EQS Inland surface water (µg/l)	AA-EQS Other Surface waters (µg/l)	MAC-EQS Other Surface waters (µg/l)
Benzene	10	50	8	50

Threshold Values for Groundwater			
Determinand	**Groundwater Impact on Surface Water (µg/l)**	**Drinking water Protected Area (µg/l)**	**General Quality of Groundwater Body (µg/l)**
Benzene	5.16 – 21.2	0.75	0.75
Toluene	38.2 – 157	-	-
Xylene (o+p+m)	15.5 – 63.6	-	-

6.3.2. Total Petroleum Hydrocarbons – Aliphatic

World Health Organisation	
Determinand	**Drinking Water Standard (µg/l)**
>C5 – C6	15,000
>C6 – C8	
>C8 – C10	300
>C10 – C12	
>C12 – C16	
>C16 – C21	Not Derived
>C21 – C35	Not Derived

6.3.3. Total Petroleum Hydrocarbons – Aromatic

World Health Organisation	
Determinand	**Drinking Water Standard (µg/l)**
>EC5 – EC7	10
>EC7 – EC8	700
>EC8 – EC10	300
>EC10 – EC12	90
>EC12 – EC16	
>EC16 – EC21	90
>EC21 – EC35	

6.4. Polycyclic Aromatic Hydrocarbons (PAHs)

EQS for Priority Substances and other substances				
Determinand	**AA-EQS Inland surface water (µg/l)**	**MAC-EQS Inland surface water (µg/l)**	**AA-EQS Other Surface waters (µg/l)**	**MAC-EQS Other Surface waters (µg/l)**
Anthracene	0.1	0.1	0.1	0.1
Fluoranthene	0.0063	0.12	0.0063	0.12
Naphthalene	2	130	2	130
Benzo(a)pyrene	0.00017	0.27	0.00017	0.027
Benzo(b)fluoranthene	*	0.017	*	0.017
Benzo(k)fluoranthene	*	0.017	*	0.017
Benzo(ghi)perylene	*	0.0082	*	0.00082
Indeno(123-cd)pyrene	*	-	*	-

*For the group of priority substances of polyaromatic hydrocarbons, the AA-EQS in water refer to the concentration of benzo(a)pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene must be monitored for comparison with the corresponding AA-EQS.

Threshold Values for Groundwater			
Determinand	**Groundwater Impact on Surface Water (µg/l)**	**Drinking water Protected Area (µg/l)**	**General Quality of Groundwater Body (µg/l)**
Anthracene	0.052 – 0.193	-	-
Benzo(a)pyrene	0.000089 – 0.000328	0.0075	-
Benzo(b)fluoranthene	0.016 – 0.058	0.075	-
Fluoranthene	0.0033 – 0.0122	-	0.075
Naphthalene	1.03 – 4.24	-	0.075

Drinking Water Standards	
Determinand	**Maximum allowable Concentration at compliance point (µg/l)**
Benzo(a)pyrene	0.010
Benzo(b) fluoranthene	0.10
Benzo(k)fluoranthene	
Benzo(ghi)perylene	
Indeno(1,2,3-cd)pyrene	

6.5. Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)

EQS for Priority Substances and other substances				
Determinand	**AA-EQS Inland surface water (µg/l)**	**MAC-EQS Inland surface water (µg/l)**	**AA-EQS Other Surface waters (µg/l)**	**MAC-EQS Other Surface waters (µg/l)**
Perfluorooctane sulfonic acid (PFOS)	0.00065	36	0.00013	7.2

6.6. Volatile and Semi-volatile Organic Compounds

SoBRA GAC_{gwvap} for Petroleum Hydrocarbons			
Determinand	**GAC_{gwvap} (µg/l)[1,2]**		**Aqueous Solubility (µg/l)**
	Residential	**Commercial**	
1,2,4-Trimethylbenzene	24	2,200	559,000
Benzene[3]	210	20,000	1,780,000
Ethylbenzene[3]	10,000	*960,000 (sol)*	180,000
Isopropylbenzene	850	*86,000 (sol)*	56,000
Propylbenzene	2,700	*240,000 (sol)*	54,100
Styrene	8,800	*810,000 (sol)*	290,000
Toluene[3]	230,000	*21,000,000 (sol)*	590,000
TPH Aliphatic EC5-EC6[3]	1,900	*190,000 (sol)*	35,900
TPH Aliphatic >EC6-EC8[3]	1,500	*150,000 (sol)*	5,370
TPH Aliphatic >EC8-EC10[3]	57	*5,700 (sol)*	427
TPH Aliphatic >EC10-EC12[3]	37	*3,600 (sol)*	34
TPH Aromatic >EC5-EC7[3]	210,000	*20,000,000 (sol)*	1,780,000
TPH Aromatic >EC7-EC8[3]	220,000	*21,000,000 (sol)*	590,000
TPH Aromatic >EC8-EC10[3]	1,900	*190,000 (sol)*	64,600
TPH Aromatic >EC10-EC12[3]	6,800	*660,000 (sol)*	24,500
TPH Aromatic >EC12-EC16[3]	39,000	*3,700,000 (sol)*	5,750
m-Xylene[3,5]	9,500	*940,000 (sol)*	200,000
o-Xylene[3,5]	12,000	*1,100,000 (sol)*	173,000
p-Xylene[2,	9,900	*980,000 (sol)*	200,000
Notes			

1. GAC in *italics* with (sol) exceed aqueous solubility.
2. GAC rounded to two significant figures.
3. The GAC for these petroleum hydrocarbon contaminants have been calculated using a sub-surface soil to indoor air correction factor of 10 in line with the physical-chemical data sources.
4. The GAC for TPH fractions do not account for genotoxic mutagenic effects. Concentrations of TPH Aromatic >EC5-EC7 should therefore also be compared with the GAC for benzene to ensure that such effects are also assessed.
5. The Health Criteria Value used for each xylene isomer was for total xylene. If site specific additivity assessments are not completed, as a conservative measure the sum of isomer concentrations should be compared to the lowest xylene GAC (as is the case for soil GAC).

SoBRA GAC_{gwvap} for Polycyclic Aromatic Hydrocarbons

Determinand	GAC_{gwvap} (µg/l) [1,2]		Aqueous Solubility (µg/l)
	Residential	Commercial	
Acenaphthene	*170,000 (sol)*	*15,000,000 (sol)*	4,110
Acenaphthylene	*220,000 (sol)*	*20,000,000 (sol)*	7,950
Fluorene	*210,000 (sol)*	*18,000,000 (sol)*	1,860
Naphthalene	220	*23,000 (sol)*	19,000

Notes
1. GAC in *italics* with (sol) exceed aqueous solubility.
2. GAC rounded to two significant figures.

SoBRA GAC_{gwvap} for Pesticides

Determinand	GAC_{gwvap} (µg/l) [1,2]		Aqueous Solubility (µg/l)
	Residential	Commercial	
Aldrin	*47 (sol)*	*3,700 (sol)*	20
***alpha*-Endosulfan**	*7,400 (sol)*	*590,000 (sol)*	530
***beta*-Endosulfan**	*7,500 (sol)*	*600,000 (sol)*	280

Notes
1. GAC in *italics* with (sol) exceed aqueous solubility.
2. GAC rounded to two significant figures.

SoBRA GAC_{gwvap} for Halogenated Organics

Determinand	GAC_{gwvap} (µg/l) [1,2]		Aqueous Solubility (µg/l)
	Residential	Commercial	
1,1,1,2-Tetrachloroethane	240	22,000	1,110,000
1,1,1-Trichloroethane	3,000	290,000	1,300,000
1,1,2,2-Tetrachloroethane	1,600	150,000	2,930,000
1,1,2-Trichloroethane	520	49,000	4,491,000
1,1-Dichloroethane	2,700	260,000	3,666,000
1,1-Dichloroethene	160	16,000	3,100,000
1,2,3,4-Tetrachlorobenzene	240	*31,000 (sol)*	7,800
1,2,3,5-Tetrachlorobenzene	7.0	600	3,500
1,2,3-Trichlorobenzene	35	3,100	21,000
1,2,4,5-Tetrachlorobenzene	8.1	*700 (sol)*	600
1,2,4-Trichlorobenzene	68	7,200	41,400
1,2-Dichlorobenzene	2,000	*220,000 (sol)*	133,000
1,2-Dichloroethane	8.9	850	8,680,000
1,2-Dichloropropane	22	2,600	2,050,000

1,3,5-Trichlorobenzene	7.4	660	6,000
1,3-Dichlorobenzene	31	2,800	103,000
1,4-Dichlorobenzene	5,000	*460,000 (sol)*	51,200
Bromobenzene	220	20,000	388,040
Bromodichloromethane	17	1,600	3,000,000
Bromoform (Tribromomethane)	3,100	400,000	3,000,000
Chlorobenzene	98	15,000	387,000
Chloroethane	10,000	1,000,000	5,742,000
Chloroethene (Vinyl Chloride)	0.62	63	2,760,000
Chloromethane	14	1,400	5,350,000
cis-1,2-Dichloroethene	130	13,000	7,550,000
Dichloromethane	3,300	370,000	20,080,000
Hexachlorobenzene	*16 (sol)*	*1,400 (sol)*	10
Hexachlorobutadiene	1.7	230	4,800
Hexachloroethane	8.5	740	49,900
Pentachlorobenzene	140	*12,000 (sol)*	500
Tetrachloroethene	34	4,600	225,000
Tetrachloromethane (Carbon Tetrachloride)	5.3	770	846,000
trans-1,2-Dichloroethene	160	16,000	5,250,000
Trichloroethene	5.7	530	1,370,000
Trichloromethane (Chloroform)	790	85,000	8,950,000

Notes
1. GAC in *italics* with (sol) exceed aqueous solubility.
2. GAC rounded to two significant figures.

SoBRA GAC_{gwvap} for Others (organic and inorganic)			
Determinand	**GAC_{gwvap} (µg/l) [1,2]**		**Aqueous Solubility (µg/l)**
	Residential	**Commercial**	
2-Chloronaphthalene	160	*14,000 (sol)*	11,700
Biphenyl (Lemonene)	*15,000 (sol)*	*1,300,000 (sol)*	4,060
Carbon disulphide	56	5,600	2,100,000
Mercury, elemental	1.1	*95 (sol)*	56
Methyl tertiary butyl ether (MTBE)	83,000	7,800,000	48,000,000

Notes
1. GAC in *italics* with (sol) exceed aqueous solubility.
2. GAC rounded to two significant figures.

7. Climate Change

Review of the publication by SoBRA referenced: Guidance on Assessing Risk to Controlled Waters from UK Land Contamination Under Conditions of Future Climate Change, August 2022, addresses the consideration of climate change as part of groundwater risk assessments. Following the development of a preliminary Conceptual Site Model (CSM), climate change should be included by re-evaluating the potential Source-Pathway-Receptor (SPR) linkage assessment to account for the potential effects of climate change based on projections for the region of the site. It is recommended where practicable to use at least two contrasting future climate change scenarios, incorporating information for the periods of 2020s, 2050s and 2080s dependent on the relevant timeframe to the specific assessment. A qualitative assessment of the impact of climate change on the SPRs and resultant impacts on the contaminants linkages within the CSM. Quantitative data can be used to re-address the generic quantitative risk assessment for medium to long term climate change effects. For short-term extreme weather events the of "what if" scenarios should be considered. Consideration also needs to be given to the shortcomings of available simulation models in the UK where they are not equipped to model

temporal changes to parameter values and where mitigation measures may be appropriate to address this.

APPENDIX E:
Waste Hazard Assessment

2 The Long Barn, Norton Farm, Selborne Road, Alton, Hampshire GU34 3NB
0333 600 1221 enquiries@groundandwater.co.uk **groundandwater.co.uk**

Registered Office: Kineton House, 31 Horse Fair, Banbury, Oxfordshire OX16 0AE Registered in England No. 07032001

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

SJQ4O-6DVZD-II5QC

Job name

GWPR5623

Description/Comments

Project

GWPR5623

Site

Kings Pond, Alton

Classified by

Name:
Natasha Kearl
Date:
07 Nov 2023 10:48 GMT
Telephone:
01420 463047

Company:
Ground and Water
2 The Long Barn, Norton Farm, Selborne Road
Alton
GU34 3NB

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: -

Course	Date
Hazardous Waste Classification	-

Purpose of classification

2 - Material Characterisation

Address of the waste

Kings Pond, Alton **Post Code** GU34 2SZ

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

dredging works of the pond

Description of the specific process, sub-process and/or activity that created the waste

waste created during dredging works

Description of the waste

ALLUVIUM: Black to dark brown SILT with frequent organic detritus.

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	TP01-061023--1.10	1.10	Non Hazardous		3
2	TP02-061023--1.20	1.20	Non Hazardous		6
3	TP03-061023--1.20	1.20	Non Hazardous		8
4	TP04-061023--0.70	0.70	Non Hazardous		10
5	TP05-061023--0.50	0.50	Non Hazardous		13

Related documents

#	Name	Description
1	231011-65.hwol	ALS Hawarden .hwol file used to populate the Job

Report

Created by: Natasha Kearl

Created date: 07 Nov 2023 10:48 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	15
Appendix B: Rationale for selection of metal species	16
Appendix C: Version	17

Classification of sample: TP01-061023--1.10

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP01-061023--1.10
Sample Depth:
1.10 m
Moisture content:
75%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 75% Wet Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		acenaphthene		201-469-6	83-32-9		<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<**LOD**
2		acenaphthylene		205-917-1	208-96-8		<0.12	mg/kg		<0.12	mg/kg	<0.000012 %		<**LOD**
3		anthracene		204-371-1	120-12-7		<0.16	mg/kg		<0.16	mg/kg	<0.000016 %		<**LOD**
4		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		4.55	mg/kg	1.32	1.502	mg/kg	0.00015 %	✓	
5		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		2.94	mg/kg		0.735	mg/kg	0.0000735 %	✓	
6		benzene	601-020-00-8	200-753-7	71-43-2		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
7		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		4.81	mg/kg		1.203	mg/kg	0.00012 %	✓	
8		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		6.2	mg/kg		1.55	mg/kg	0.000155 %	✓	
9		benzo[ghi]perylene		205-883-8	191-24-2		4.29	mg/kg		1.073	mg/kg	0.000107 %	✓	
10		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		2.2	mg/kg		0.55	mg/kg	0.000055 %	✓	
11		boron { boron tribromide }	005-003-00-0	233-657-9	10294-33-4		<1	mg/kg	23.173	<23.173	mg/kg	<0.00232 %		<**LOD**
12		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.556	mg/kg	1.285	0.179	mg/kg	0.0000139 %	✓	
13		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.6	mg/kg	1.923	<1.154	mg/kg	<0.000115 %		<**LOD**
14		chrysene	601-048-00-0	205-923-4	218-01-9		3.44	mg/kg		0.86	mg/kg	0.000086 %	✓	
15		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		47.9	mg/kg	1.126	13.483	mg/kg	0.00135 %	✓	
16		coronene		205-881-7	191-07-1		1.19	mg/kg		0.298	mg/kg	0.0000298 %	✓	

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
17	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
18	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.23 mg/kg		<0.23 mg/kg	<0.000023 %		<LOD
19	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
20	fluoranthene		205-912-4	206-44-0		4.98 mg/kg		1.245 mg/kg	0.000125 %	✓	
21	fluorene		201-695-5	86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
22	indeno[123-cd]pyrene		205-893-2	193-39-5		3.41 mg/kg		0.853 mg/kg	0.0000852 %	✓	
23	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	165 mg/kg	1.56	64.342 mg/kg	0.00413 %	✓	
24	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.151 mg/kg	1.353	0.0511 mg/kg	0.00000511 %	✓	
25	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
26	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.09 mg/kg		<0.09 mg/kg	<0.000009 %		<LOD
27	nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		13.9 mg/kg	1.579	5.489 mg/kg	0.000549 %	✓	
28	pH			PH		7.9 pH		7.9 pH	7.9 pH		
29	phenanthrene		201-581-5	85-01-8		1.19 mg/kg		0.298 mg/kg	0.0000298 %	✓	
30	phenol	604-001-00-2	203-632-7	108-95-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
31	pyrene		204-927-3	129-00-0		4.39 mg/kg		1.098 mg/kg	0.00011 %	✓	
32	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2.53 mg/kg	1.405	0.889 mg/kg	0.0000889 %	✓	
33	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.21 mg/kg		<0.21 mg/kg	<0.000021 %		<LOD
34	toluene	601-021-00-3	203-625-9	108-88-3		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
35	TPH (C6 to C40) petroleum group			TPH		941 mg/kg		235.25 mg/kg	0.0235 %	✓	
36	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		17.5 mg/kg	1.785	7.81 mg/kg	0.000781 %	✓	
37	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		325 mg/kg	2.774	225.399 mg/kg	0.0225 %	✓	
38	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.08 mg/kg		<0.08 mg/kg	<0.000008 %		<LOD
39	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		17.2 mg/kg	1.462	6.285 mg/kg	0.000628 %	✓	
								Total:	0.0575 %		

Key	
	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Most likely worst case.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0235%)

Classification of sample: TP02-061023--1.20

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP02-061023--1.20
Sample Depth:
1.20 m
Moisture content:
74%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 74% Wet Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	acenaphthene		201-469-6	83-32-9		<0.08 mg/kg		<0.08 mg/kg	<0.000008 %		<LOD
2	acenaphthylene		205-917-1	208-96-8		<0.12 mg/kg		<0.12 mg/kg	<0.000012 %		<LOD
3	anthracene		204-371-1	120-12-7		<0.16 mg/kg		<0.16 mg/kg	<0.000016 %		<LOD
4	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		4.03 mg/kg	1.32	1.383 mg/kg	0.000138 %	✓	
5	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		2.92 mg/kg		0.759 mg/kg	0.0000759 %	✓	
6	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		4.55 mg/kg		1.183 mg/kg	0.000118 %	✓	
7	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		5.68 mg/kg		1.477 mg/kg	0.000148 %	✓	
8	benzo[ghi]perylene		205-883-8	191-24-2		3.77 mg/kg		0.98 mg/kg	0.000098 %	✓	
9	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		2.37 mg/kg		0.616 mg/kg	0.0000616 %	✓	
10	boron { boron tribromide }	005-003-00-0	233-657-9	10294-33-4		<1 mg/kg	23.173	<23.173 mg/kg	<0.00232 %		<LOD
11	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.742 mg/kg	1.285	0.248 mg/kg	0.0000193 %	✓	
12	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.6 mg/kg	1.923	<1.154 mg/kg	<0.000115 %		<LOD
13	chrysene	601-048-00-0	205-923-4	218-01-9		3.6 mg/kg		0.936 mg/kg	0.0000936 %	✓	
14	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		49.9 mg/kg	1.126	14.607 mg/kg	0.00146 %	✓	
15	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
16		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.23	mg/kg		<0.23	mg/kg	<0.000023 %		<**LOD**
17		fluoranthene		205-912-4	206-44-0		5.5	mg/kg		1.43	mg/kg	0.000143 %	✓	
18		fluorene		201-695-5	86-73-7		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
19		indeno[123-cd]pyrene		205-893-2	193-39-5		3.68	mg/kg		0.957	mg/kg	0.0000957 %	✓	
20		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	202	mg/kg	1.56	81.921	mg/kg	0.00525 %	✓	
21		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.181	mg/kg	1.353	0.0637	mg/kg	0.00000637 %	✓	
22		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.09	mg/kg		<0.09	mg/kg	<0.000009 %		<**LOD**
23		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		11.1	mg/kg	1.579	4.558	mg/kg	0.000456 %	✓	
24		pH			PH		7.88	pH		7.88	pH	7.88 pH		
25		phenanthrene		201-581-5	85-01-8		1.24	mg/kg		0.322	mg/kg	0.0000322 %	✓	
26		phenol	604-001-00-2	203-632-7	108-95-2		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
27		pyrene		204-927-3	129-00-0		4.83	mg/kg		1.256	mg/kg	0.000126 %	✓	
28		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2.93	mg/kg	1.405	1.07	mg/kg	0.000107 %	✓	
29		vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		15.5	mg/kg	1.785	7.194	mg/kg	0.000719 %	✓	
30		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		367	mg/kg	2.774	264.709	mg/kg	0.0265 %	✓	
31		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		17.6	mg/kg	1.462	6.688	mg/kg	0.000669 %	✓	
											Total:	0.039 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP03-061023--1.20

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP03-061023--1.20
Sample Depth:
1.20 m
Moisture content:
72%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 72% Wet Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	acenaphthene		201-469-6	83-32-9		0.392 mg/kg		0.11 mg/kg	0.000011 %	✓	
2	acenaphthylene		205-917-1	208-96-8		0.906 mg/kg		0.254 mg/kg	0.0000254 %	✓	
3	anthracene		204-371-1	120-12-7		1.72 mg/kg		0.482 mg/kg	0.0000482 %	✓	
4	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		7.91 mg/kg	1.32	2.924 mg/kg	0.000292 %	✓	
5	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		9.27 mg/kg		2.596 mg/kg	0.00026 %	✓	
6	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		14.1 mg/kg		3.948 mg/kg	0.000395 %	✓	
7	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		16.3 mg/kg		4.564 mg/kg	0.000456 %	✓	
8	benzo[ghi]perylene		205-883-8	191-24-2		10.5 mg/kg		2.94 mg/kg	0.000294 %	✓	
9	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		6.23 mg/kg		1.744 mg/kg	0.000174 %	✓	
10	boron { boron tribromide }	005-003-00-0	233-657-9	10294-33-4		<1 mg/kg	23.173	<23.173 mg/kg	<0.00232 %		<**LOD**
11	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.16 mg/kg	1.285	0.417 mg/kg	0.0000325 %	✓	
12	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.6 mg/kg	1.923	<1.154 mg/kg	<0.000115 %		<**LOD**
13	chrysene	601-048-00-0	205-923-4	218-01-9		9.63 mg/kg		2.696 mg/kg	0.00027 %	✓	
14	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		81.4 mg/kg	1.126	25.661 mg/kg	0.00257 %	✓	
15	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
16		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		1.73	mg/kg		0.484	mg/kg	0.0000484 %	✓	
17		fluoranthene		205-912-4	206-44-0		17.9	mg/kg		5.012	mg/kg	0.000501 %	✓	
18		fluorene		201-695-5	86-73-7		0.457	mg/kg		0.128	mg/kg	0.0000128 %	✓	
19		indeno[123-cd]pyrene		205-893-2	193-39-5		8.89	mg/kg		2.489	mg/kg	0.000249 %	✓	
20		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	446	mg/kg	1.56	194.79	mg/kg	0.0125 %	✓	
21		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.83	mg/kg	1.353	0.315	mg/kg	0.0000315 %	✓	
22		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.09	mg/kg		<0.09	mg/kg	<0.000009 %		**<LOD**
23		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		16.8	mg/kg	1.579	7.43	mg/kg	0.000743 %	✓	
24		pH			PH		7.64	pH		7.64	pH	7.64 pH		
25		phenanthrene		201-581-5	85-01-8		4.04	mg/kg		1.131	mg/kg	0.000113 %	✓	
26		phenol	604-001-00-2	203-632-7	108-95-2		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
27		pyrene		204-927-3	129-00-0		15.5	mg/kg		4.34	mg/kg	0.000434 %	✓	
28		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2.93	mg/kg	1.405	1.153	mg/kg	0.000115 %	✓	
29		vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		24.2	mg/kg	1.785	12.096	mg/kg	0.00121 %	✓	
30		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		474	mg/kg	2.774	368.185	mg/kg	0.0368 %	✓	
31		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		22.5	mg/kg	1.462	9.208	mg/kg	0.000921 %	✓	
											Total:	0.0611 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP04-061023--0.70

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP04-061023--0.70
Sample Depth:
0.70 m
Moisture content:
76%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 76% Wet Weight Moisture Correction applied (MC)

#		Determinand EU CLP index number / EC Number / CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1		acenaphthene 201-469-6 / 83-32-9		<0.08 mg/kg		<0.08 mg/kg	<0.000008 %		<**LOD**
2		acenaphthylene 205-917-1 / 208-96-8		<0.12 mg/kg		<0.12 mg/kg	<0.000012 %		<**LOD**
3		anthracene 204-371-1 / 120-12-7		<0.16 mg/kg		<0.16 mg/kg	<0.000016 %		<**LOD**
4		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		6.98 mg/kg	1.32	2.212 mg/kg	0.000221 %	✓	
5		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		3.24 mg/kg		0.778 mg/kg	0.0000778 %	✓	
6		benzene 601-020-00-8 / 200-753-7 / 71-43-2		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<**LOD**
7		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		4.47 mg/kg		1.073 mg/kg	0.000107 %	✓	
8		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		5.08 mg/kg		1.219 mg/kg	0.000122 %	✓	
9		benzo[ghi]perylene 205-883-8 / 191-24-2		3.69 mg/kg		0.886 mg/kg	0.0000886 %	✓	
10		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		2.34 mg/kg		0.562 mg/kg	0.0000562 %	✓	
11		boron { boron tribromide } 005-003-00-0 / 233-657-9 / 10294-33-4		1.05 mg/kg	23.173	5.84 mg/kg	0.000584 %	✓	
12		cadmium { cadmium sulfide } 048-010-00-4 / 215-147-8 / 1306-23-6	1	0.942 mg/kg	1.285	0.291 mg/kg	0.0000226 %	✓	
13		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.6 mg/kg	1.923	<1.154 mg/kg	<0.000115 %		<**LOD**
14		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		3.69 mg/kg		0.886 mg/kg	0.0000886 %	✓	
15		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		88.2 mg/kg	1.126	23.833 mg/kg	0.00238 %	✓	
16		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides,		<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5											
17		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.23	mg/kg		<0.23	mg/kg	<0.000023 %		<LOD
18		ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
19		fluoranthene		205-912-4	206-44-0		5.81	mg/kg		1.394	mg/kg	0.000139 %	✓	
20		fluorene		201-695-5	86-73-7		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
21		indeno[123-cd]pyrene		205-893-2	193-39-5		3.09	mg/kg		0.742	mg/kg	0.0000742 %	✓	
22		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	271	mg/kg	1.56	101.45	mg/kg	0.0065 %	✓	
23		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.455	mg/kg	1.353	0.148	mg/kg	0.0000148 %	✓	
24		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
25		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.09	mg/kg		<0.09	mg/kg	<0.000009 %		<LOD
26		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		19.4	mg/kg	1.579	7.354	mg/kg	0.000735 %	✓	
27		pH			PH		7.71	pH		7.71	pH	7.71 pH		
28		phenanthrene		201-581-5	85-01-8		1.55	mg/kg		0.372	mg/kg	0.0000372 %	✓	
29		phenol	604-001-00-2	203-632-7	108-95-2		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
30		pyrene		204-927-3	129-00-0		5.24	mg/kg		1.258	mg/kg	0.000126 %	✓	
31		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2.79	mg/kg	1.405	0.941	mg/kg	0.0000941 %	✓	
32		toluene	601-021-00-3	203-625-9	108-88-3		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
33		TPH (C6 to C40) petroleum group			TPH		711	mg/kg		170.64	mg/kg	0.0171 %	✓	
34		vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		25.8	mg/kg	1.785	11.054	mg/kg	0.00111 %	✓	
35		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		488	mg/kg	2.774	324.908	mg/kg	0.0325 %	✓	
36		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
37		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		32	mg/kg	1.462	11.225	mg/kg	0.00112 %	✓	
											Total:	0.0637 %		

Key	
	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Most likely worst case.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0171%)

Classification of sample: TP05-061023--0.50

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP05-061023--0.50
Sample Depth:
0.50 m
Moisture content:
75%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 75% Wet Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		acenaphthene		201-469-6	83-32-9		<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<**LOD**
2		acenaphthylene		205-917-1	208-96-8		<0.12	mg/kg		<0.12	mg/kg	<0.000012 %		<**LOD**
3		anthracene		204-371-1	120-12-7		<0.32	mg/kg		<0.32	mg/kg	<0.000032 %		<**LOD**
4		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		7.32	mg/kg	1.32	2.416	mg/kg	0.000242 %	✓	
5		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		7.08	mg/kg		1.77	mg/kg	0.000177 %	✓	
6		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		8.35	mg/kg		2.088	mg/kg	0.000209 %	✓	
7		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		9.63	mg/kg		2.408	mg/kg	0.000241 %	✓	
8		benzo[ghi]perylene		205-883-8	191-24-2		5.76	mg/kg		1.44	mg/kg	0.000144 %	✓	
9		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		3.9	mg/kg		0.975	mg/kg	0.0000975 %	✓	
10		boron { boron tribromide }	005-003-00-0	233-657-9	10294-33-4		1.47	mg/kg	23.173	8.516	mg/kg	0.000852 %	✓	
11		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.32	mg/kg	1.285	0.424	mg/kg	0.000033 %	✓	
12		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.6	mg/kg	1.923	<1.154	mg/kg	<0.000115 %		<**LOD**
13		chrysene	601-048-00-0	205-923-4	218-01-9		7.75	mg/kg		1.938	mg/kg	0.000194 %	✓	
14		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		87.4	mg/kg	1.126	24.601	mg/kg	0.00246 %	✓	
15		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
16		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.46	mg/kg		<0.46	mg/kg	<0.000046 %		<LOD
17		fluoranthene		205-912-4	206-44-0		14.4	mg/kg		3.6	mg/kg	0.00036 %	✓	
18		fluorene		201-695-5	86-73-7		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
19		indeno[123-cd]pyrene		205-893-2	193-39-5		4.81	mg/kg		1.203	mg/kg	0.00012 %	✓	
20		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	271	mg/kg	1.56	105.677	mg/kg	0.00678 %	✓	
21		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.163	mg/kg	1.353	0.0552	mg/kg	0.00000552 %	✓	
22		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.09	mg/kg		<0.09	mg/kg	<0.000009 %		<LOD
23		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		18.6	mg/kg	1.579	7.345	mg/kg	0.000734 %	✓	
24		pH			PH		7.34	pH		7.34	pH	7.34 pH		
25		phenanthrene		201-581-5	85-01-8		4.33	mg/kg		1.083	mg/kg	0.000108 %	✓	
26		phenol	604-001-00-2	203-632-7	108-95-2		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
27		pyrene		204-927-3	129-00-0		12.5	mg/kg		3.125	mg/kg	0.000313 %	✓	
28		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2.37	mg/kg	1.405	0.832	mg/kg	0.0000832 %	✓	
29		vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		24.8	mg/kg	1.785	11.068	mg/kg	0.00111 %	✓	
30		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		705	mg/kg	2.774	488.943	mg/kg	0.0489 %	✓	
31		asbestos	650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5		<0.001	%		<0.001	%	<0.001 %		<LOD
32		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		31.2	mg/kg	1.462	11.4	mg/kg	0.00114 %	✓	
											Total:	0.0657 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non GB MCL determinands

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

anthracene (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

benzo[ghi]perylene (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

coronene (EC Number: 205-881-7, CAS Number: 191-07-1)

Description/Comments: Data from C&L Inventory Database; no entries in Registered Substances or Pesticides Properties databases; SDS: Sigma Aldrich, 1907/2006 compliant, dated 2012 - no entries; IARC – Group 3, not carcinogenic.
Data source: http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=17010&HarmOnly=no?fc=true&lang=en
Data source date: 16 Jun 2014
Hazard Statements: STOT SE 2; H371

salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex

GB MCL index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

ethylbenzene (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

fluoranthene (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

indeno[123-cd]pyrene (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

pyrene (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

polychlorobiphenyls; PCB (EC Number: 215-648-1, CAS Number: 1336-36-3)

GB MCL index number: 602-039-00-4
Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans;

POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.
Additional Hazard Statement(s): Carc. 1A; H350
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 1A; H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

divanadium pentaoxide; vanadium pentoxide (EC Number: 215-239-8, CAS Number: 1314-62-1)

GB MCL index number: 023-001-00-8
Description/Comments: Hazard statements H301, H330, H350 added by HazWasteOnline due to ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be Carc. 1B; H350. The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List]. Substance has therefore been self-classified.
Additional Hazard Statement(s): Carc. 1B; H350 , Acute Tox. 3; H301 , Acute Tox. 2; H330
Reason for additional Hazards Statement(s):
20 Sep 2022 - Carc. 1B; H350 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be Carc. 1B; H350. The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List]. Substance has therefore been self-classified.
28 Sep 2022 - Acute Tox. 3; H301 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be "Acute tox 3; H301". The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List]. Substance has therefore been self-classified.
28 Sep 2022 - Acute Tox. 2; H330 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be "Acute tox 2; H330". The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List]. Substance has therefore been self-classified.

chromium(III) oxide (worst case) (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Most likely worst-case

boron {boron tribromide}

worst-case

cadmium {cadmium sulfide}

Most likely worst-case

chromium in chromium(VI) compounds {chromium(VI) oxide}

Most likely worst-case

copper {dicopper oxide; copper (I) oxide}

Most likely worst-case

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Most likely worst-case

lead {lead chromate}

worst-case

mercury {mercury dichloride}

Most likely worst-case

nickel {nickel dihydroxide}

Most likely worst-case

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Most likely worst-case

vanadium {divanadium pentaoxide; vanadium pentoxide}

Most likely worst-case

zinc {zinc chromate}

worst-case

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

worst case

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2023.308.5798.10726 (04 Nov 2023)
HazWasteOnline Database: 2023.308.5798.10726 (04 Nov 2023)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021

APPENDIX D: STATUTORY INFORMATION

Technics Desktop Subsurface Utility Report. Ref: SP231812