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Land off Storrington Lane
Thakeham
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Groundwater Quality Assessment

On behalf of Akehurst Homes Ltd



Document Reference: 13273 June 2024

air quality assessment contaminated land ecology environmental audits noise assessment
environmental impact assessments flood risk assessments geotechnical engineering ground investigation
hydrogeology noxious weeds remediation design risk assessments waste management

Site: Land off Storrington Lane

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1 INTRODUCTION

Ground and Environmental Services Ltd (GES) were commissioned by Akehurst Homes Ltd to carry out a round of investigative groundwater sampling and testing from boreholes at Land off Storrington Lane in Thakeham and ultimately, based on the measured groundwater quality, produce a groundwater quality assessment report.

We understand that it is proposed to use the boreholes on site for a potable water abstraction and that the groundwater quality testing has been requested by Horsham District Council (HDC) to support the application.

We note that a previous round of groundwater sampling and testing (November 2023) has been carried out following an assessment of the abstraction potential of the well(s) and that the sampling and testing details were not reported.

The 2023 testing suite was comprehensive but concerns had been raised about certain volatile compounds and in addition bacteria was identified in the groundwater. We understand that a detailed interpretative assessment of the water quality was not provided and that HDC subsequently requested such, along with the requirement for further parameters to be included in the suite.

The purpose of the investigative works carried out was to collect and test representative samples of the groundwater on site and provide an interpretative assessment of the results and compare the quality to the UK drinking water standards in order to determine whether industry standard water pre-treatment methods could be used, if required, to allow the use of potable water abstracted on site.

The testing suite has been extended to include organochlorine pesticides and polyfluoroalkyl substances.

Previous reports compiled and submitted for the site and relevant to this work include a borehole prognosis report by WSP (reference: 62241301 / 001 / R342 January 2023) and a hydrological impact assessment compiled by Stephen Buss Environmental Consulting (reference 2023-095-023-001, 10/01/24).

2 SITE BACKGROUND

The site was formerly used as a field for over 150 years. The 2022 preliminary environmental site assessment indicated that the site can be classified as low risk in terms of contamination and no intrusive site investigation was deemed necessary.

2.1 Geology

No superficial deposits are noted on site on the British Geological Survey online geological mapping of the area or on the BGS Map sheet 317/332 and the bedrock geology is shown as below.

Group	Formation	Description	Thickness
Lower Greensand	Sandgate	fine sands, silts and silty clay	~35 m
	Hythe	alternating layers of hard bluish grey sandy limestone and a grey loosely cemented calcareous argillaceous sandstone speckled with glauconite.	~45 m
	Atherfield Clay	shales and mudstone which weather to grey, blue, green and brown mottled clays and silty clays.	5-10 m
Wealden Group	Weald Clay	typically comprises cyclic sequences of dark grey silts and clays, with subordinate siltstones, sandstones, shelly limestones and clay ironstones.	120-175 m

The likely strata thicknesses are as reported in the WSP report. The Nicholls boreholes driller's logs reported the following geological sequence on site.

Driller's Log	Interpreted stratigraphy	Thickness (m)
Brown to grey CLAY	Fittleworth Member (Sandgate Formation)	28
SANDSTONE with limestone bands	Hythe Formation	30
Grey CLAY	Atherfield Clay	0.5

2.2 Groundwater

Reference to the British Geological Survey 1:50,000 scale Aquifer Designation Dataset, shows the site to be set upon a Principal Aquifer in the sandstone, The Hythe Formation, and the site is located within a Groundwater Source Protection Zone (SPZ) which is for the abstraction at the nearby Smock Alley Pumping Station.

The site lies within an area of high-risk groundwater vulnerability and down gradient from the Thakeham Mushrooms site. There was a fire at the mushroom farm. It is understood that records are held with the fire service showing the fire was of straw and that no foams were used during the fire fighting.

2.3 Aquifer details

The Hythe Formation aquifer unit (part of the Lower Greensand Formation) is confined beneath by Atherfield Clays and above by the Sandgate Formation.

The Fittleworth Member, a unit within the Sandgate Formation, is described as a sequence of sandy clays and clayey sands and its aquifer classification would suggest there is transmissivity in this geological unit.

The confined groundwaters are reducing which has led to denitrification and an increase in iron and manganese concentrations. Trace-element concentrations are generally low, with most being within drinking water standards/EU guide values for human consumption.

The median background concentration of barium in the groundwater has been noted in excess of screening levels at times along with iron which is present in higher concentrations in the deep aquifer with low dissolved oxygen concentrations.

The aquifer contains fines sands/silts. The groundwater abstracted can be turbid which is caused principally by inorganic matter in suspension including mineral sediments and oxides of iron or manganese.

The groundwater chemistry is dictated by its mineralogy, by redox reactions and the anaerobic conditions which are due to the confinement. These processes include mineral dissolution and ion exchange. These conditions promote good attenuation of any soil pollutants.

Nitrates present in the groundwater are considered present due to diffuse anthropogenic influence. The elevated iron and manganese levels due to natural redox reactions in the aquifer.

Bacteria would not generally be expected in a deep confined aquifer.

2.4 Borehole details

The borehole details as reported by Nicholls are summarised below. The locations of the boreholes are shown at Figure 1.

The boreholes were drilled to 58 m depth in October 2023 at a diameter of 200 mm, with casing diameter 125 mm. Solid uPVC casing was used to 9.4 m depth, then slotted uPVC casing to 55 m depth, and solid casing below.

The locations of the boreholes are: BH1, at grid reference TQ 09982 16678, and BH2, at grid reference TQ 10030 16670. Ground levels, estimated using Environment Agency LIDAR data, are approximately 39.2 m AOD and 40.6 m AOD respectively. Groundwater levels at BH1 are consistently about 1 m deeper than those for BH2 because of the difference in ground levels.

Copies of the Nicholls borehole records, as submitted to BGS are attached at Appendix 1.

2.5 Abstraction proposal

The theoretical suitability of abstraction and abstraction rate potential for groundwater below the site have been individually reported under separate cover (borehole prognosis report and hydrogeological impact assessment). It is understood that the following abstraction rates are being applied for,

Frequency	Rate
Hourly	0.875 m^3/h
Daily	21 m^3/day
Annually	7665 m^3/year

The abstraction is to be from the confined Hythe Formation Principal Aquifer, beneath the site, which is present at outcrop to the south and east of the site.

Groundwater is not currently abstracted at Smock Alley Pumping Station which lies to the west of site, and there are boreholes to the immediate south (champions farm) and east of the site which abstract from similar depths. A summary of the local boreholes as

recorded with BGS, and reported in the WSP borehole prognosis report is shown below.

Local Boreholes with publicly available records				
Approximate distance from site	1 km Northwest	0.3 km East	2 km Northwest	3 km Northwest
Well NGR	TQ 09200 17020	TQ 10360 16570	TQ 08680 18150	TQ 07440 18070
Location	TQ01NE24/A Smock Alley Pumping Station	TQ11NW10 Abingworth	TQ01NE80 Wild Croft, The Hollow	TQ01NE20/B Nutbourne Common

3 COMPETENCY

GES have suitable comprehensive experience and competency in groundwater quality sampling and testing both for investigative purposes and for regulatory purposes to show compliance with regulatory standards.

This groundwater sampling exercise has been undertaken with due regard to with appropriate British Standards and technical guidance for investigative groundwater sampling.

We would note that in order to sample private water supplies to fulfil the ongoing monitoring requirements for private water supplies in accordance with the Private Water Supplies (England) Regulations 2016 as amended, there is a Certification of Persons Scheme based on a sampling manual. GES are not certified under the (ISO/IEC 17024 Private Water Supply Sampling) scheme.

However, while the scheme is required for demonstrating competence in the routine sampling which would be required by the Private Water Supplies Regulations, it is not applicable to investigational sampling.

The Private Water Supplies (England) Regulations monitoring requirements include sampling from running taps and is not relevant for collecting samples for investigative purposes and/or to determine the presence of sundry volatile species or demonstrate that the groundwater on site could be treated to potable water standards.

4 METHODOLOGY

In order to provide an effective groundwater sampling programme which meets the requirements, those factors that can affect the collection of representative groundwater samples and the quality of data obtained from their analysis have been considered.

The collection of samples which are representative of the *insitu* groundwater conditions at the time and location of sampling is a key objective of groundwater quality monitoring especially where measurement of a specific volatile parameter(s) is required.

For water resource evaluation or characterisation of risk to a receptor, an understanding of average groundwater chemistry is relevant and it is important to obtain a composite sample from the target water bearing zone. In this aquifer groundwater flow (and through the well screen) will be predominantly horizontal and so, over time, groundwater trapped in the well casing above the screen will become stagnant and not representative of the

adjacent formation. While it was noted that volatile species would migrate to the surface (and casing water), representative groundwater samples were collected directly from the well screen using suitable well purging and sampling methods. See below.

Previously the wells were pumped to establish potential abstraction rates etc (December 2023 24m3/day for 24 hours).

Groundwater sampling was carried out by others in November 2023 before the pumping trials (a month after the wells were drilled). GES are unaware of the sampling or purging details of the November 2023 groundwater testing round.

The nature of the purging carried out on site by GES in May 2024 immediately prior to sampling was dictated in part by the target compounds of interest and the requirement to avoid sample degassing and/or volatile losses from excessive disturbance in the water column or via any pressure drop from suction pump systems.

The purging carried out and described below was undertaken to remove stagnant groundwater in the casing only and thereby introduce fresh groundwater into the well for sampling while avoiding any hydraulically over-purging of the well(s) in order to provide optimum sampling conditions for volatiles at trace levels. GES note that *any* methods used to dewater the well(s) may introduce bias on sample quality.

Literature research shows the increased sensitivity of low volume purge and/or no purge methods over low flow purging has been demonstrated for volatile compounds and similar results have been found and reported for PFAS compounds.

In this case, purging the well(s) until stable parameters are measured is not considered an appropriate method as the concentration of any volatile compound in any existing plume would be decreased by dilution as the well recharged.

5 FIELDWORK

The groundwater sampling was carried out on the 23 May 2024. Groundwater levels were measured with a standard water level dip tape prior to the purging of the casing water. Before purging, the depths to groundwater from the headworks cover levels was 7.42 mbcl at BH1 and 6.35 mbcl at BH2.

5.1 Purging

A well-specific fixed purging volume was established as shown.

Reference to the BH installation details and the dip to water level (m) and depth of casing was used to calculate the casing water volume for each borehole. The (stagnant) casing water, which sits above the water in the well screen, was removed with bailers.

The (non-weighted) bottom filling samplers were lowered under tension and allowed to self-fill slowly from the base upwards. Once full, the bailers were removed immediately so stagnant casing groundwater was not permitted deeper in to the well to mix. Repeated lowering, filling, retrieving, and emptying to “bail down” the well to remove casing water was carried out. Three 1l bailers were bound together and used simultaneously and

approximately 36l was extracted from each well.

5.2 Sampling

Immediately following the removal of the casing water volume, a clean (un-used) bailer was used to retrieve grab samples from the well. The non-weighted bailer retrieved the sample from the top of the water column.

The bailers and cable were PFAS free materials and due care was taken during sampling to avoid any cross-contamination of the water samples by any material or equipment known to contain PFAS compounds.

The sampling methodology was suitable to allow a composite groundwater sample representative of the entire screen section and wider formation to be collected.

The samples were collected to sample containers suitable for the parameters under study, including amber glass and volatile compound vials, and packed in a cool box for transport. For PFAS analysis the use of cool packs is not recommended to avoid potential cross contamination.

6 ANALYTICAL TESTING`

The groundwater samples were subsequently sent to a UKAS accredited laboratory which holds the appropriate Mcerts for the relevant matrix and tests scheduled, including where relevant for any third subcontracted analysis.

In order to determine any contamination to groundwater from the nearby mushroom site and from any associated fire control compounds, the groundwater testing suite included organochlorine pesticides, and polyfluoroalkyl substances (PFAS) including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA).

The samples were also tested for a range of physical, chemical and microbiological parameters appropriate for assessing drinking water quality, semi volatile organic chemicals and a range of heavy and toxic metals.

7 RESULTS

7.1 2024 Groundwater Testing Results

The results of the 2024 water quality analysis are presented at Appendix 2.

The levels of organochlorine pesticides and PFAS compounds are below the limit of detection of the analytical procedure used. There was no bacteria noted in the groundwater.

The levels of ammonium, iron and manganese were noted to be present above the drinking water standards and are discussed below. The groundwater was noted as slightly turbid. The water was noted as hard.

7.2 2023 Groundwater Testing Results

Reference to the water testing results from the 2023 Nicholls sampling and the borehole records shows the wells were drilled at the end of October, and samples were retrieved at the end of November(prior to the pumping trial).

The 2023 results from the analytical laboratory were not UKAS accredited and the laboratory does not hold Mcerts for all the tests carried out. Therefore, the results can not be relied on but may be useful for comparative purposes.

The 2023 results are presented at Appendix 3 and the exceedances of manganese, iron and turbidity, with detectable E. Coli, coliforms and enterococci shown were reported in the Hydrogeological Impact Assessment. The water was also reported as being very hard water.

The 2023 testing named the locations as BH1, bottom of field and BH2 near gate. This is the opposite to the previous nomenclature used for the locations and shown at Figure 1. The table at section 8 below shows the bottom of field samples reported as BH2 and the near gate samples reported as BH1. There is no significant differences in the water quality from the two wells.

7.3 Historical Groundwater Testing Results

Historical water quality data from two boreholes abstracting from the Hythe Formation within 3 km northwest of the site showed chlorine (sol) at 21.4 mg/l and 17.1 mg/l, and nitrogen as nitrates and nitrites at 2.42 mg/l, ammonia (sol) at 0.016 mg/l. Levels of chloride and ammonium were not reported. Iron was recorded at 0.42 mg/l and 0.36 mg/l.

8 GROUNDWATER QUALITY ASSESSMENT

The results from the 2023 and 2024 testing have been tabulated below along with the current UK drinking water standards (DWS) which are applicable at the compliance point which would be the consumer's tap.

Also shown, for comparison, are the background levels expected in the aquifer.

Parameter	Concentration mg/l					
	BH1		BH2		DWS	Aquifer Background#
	2023	2024	2023	2024		
pH (unit)	6.92	7.6	6.94	7.7	6.5-9.5	7.2
EC (µS/cm)))	823	-	746	-	2500	315
Aluminum	<0.02	-	<0.02	-	0.2	0.001
Ammonium (as NH4+)	0.141	0.44	0.169	0.65	0.5	0.03
Iron	1.05(t)	2.62	0.856(t)	0.388	0.2	0.2
Calcium	150.8	66.4	140.8	72.2	No Standard	52.4
Potassium	9.8	7.7	10.1	8.3	No Standard	0.04
Sulphate	68.1	23	69.5	24	250	21.3
Chloride	50.3	24	47.3	24	250	19
Chlorine(total sol.)	-	0.68	-	<0.02	No Standard	-
Phosphate (as P)	<0.15	<1	<0.15	<1	No Standard	0.04
Manganese	0.042	0.0135	0.056	0.0142	0.05	0.014
Sodium	38	12	35	12.9	200	9.85
Turbidity	9.77	-	7.81	-	4 (NTU)	-
Boron	<0.05	<0.01	<0.05	<0.01	1	0.01
Copper	<0.1	0.0014	<0.1	0.0008	2	-
Cadmium	-	<0.0002	-	<0.0002	0.005	-
Chromium	-	0.0017	-	0.0023	0.05	0.0005
Magnesium	5.1	8.8	3.89	9.5	-	2.76
Fluoride	0.111	0.9	0.190	0.9	1.5	0.13
Lead	<0.002	0.0006	<0.002	0.0003	0.01	0.0006
Nitrate	<22	<0.5	<22	<0.5	50	0.196
Nitrite	<0.05	<0.5	<0.05	<0.5	0.5	0.002
Nitrite/Nitrate	0.1	-	0.1	-	≤1 (unitless)	-
Suspended Solids	-	9	-	10	No Standard	-
Chemical Oxygen Demand (COD)	-	10	-	14	No Standard	-
Hardness - Total (as CaCO3)##	398	202	368	220	No Standard	148
Enterococci	0	-	1	-	0 (cfu/100ml)	-
Escherichia coli (s)	0	0	1	0		
PFAS compounds	-	<0.00001	-	<0.00001	0.0001	-
Organochlorine Pesticides	-	<0.0001	-	<0.0001		

#Median concentrations/parameters for groundwaters in the Hythe aquifer units of the Lower Greensand[1]
##$mgCaCO_3/l$

The table shows that the results from the 2023 sampling and testing are largely consistent with the 2024 results which gives credibility to the accuracy of the previous dataset and

[1] Shand, P.; Cobbing, J.; Tyler-Whittle, R.; Tooth, A.F.; Lancaster, A.. 2003 *Baseline report series. 9, the Lower Greensand of southern England.* Environment Agency, 53pp. (CR/03/273N)

allows a degree of confidence in the representative nature of the sampling rounds.

The water is hard. The levels of ammonium, iron, manganese and turbidity in the groundwater are above the drinking water standards (DWS) which are applicable at the compliance point (consumers tap).

The DWS exceedances as noted above, iron, manganese and turbidity, would be considered as naturally occurring and within the range expected for local groundwater quality as shown for the background chemical profile of the groundwater in the Hythe Formation/Lower Greensand Aquifer. The chemical profile of the groundwater in the Hythe Formation/Lower Greensand Aquifer is shown at Appendix 4.

The elevated levels of ammonium may be due to diffuse anthropogenic influences but it is noted that the overlying clays afford good pollutant attenuation. The site has been in agricultural use and used for pasture and lies in a largely rural area.

The levels of chlorine (sol.) in groundwater reported in 2024 is significantly lower than 80 years ago. The levels of chloride reported currently are consistent with the aquifer background levels.

The current water quality as measured on site is considered consistent with a sandstone aquifer.

Bacteria was recorded in the groundwater on site during the 2023 sampling round. Bacteria was not indicated in the 2024 groundwater testing results. GES note that bacteria would not generally be expected in a deep confined aquifer. Bacteria may be present on headworks following installation or may be introduced during sampling or testing.

The elevated parameters measured in the groundwater on site are considered common UK groundwater contaminants and the groundwater on site as measured would be considered wholly amenable to treatment for use as potable water.

9 GROUNDWATER TREATMENT

The groundwater quality as measured on site would be amenable to treatment to make it potable using industry standard commercially available equipment.

The elevated parameters measured in the groundwater would require a combination of treatments in order to control the levels to below the DWS.

Usually, treatment consists of a number of stages. In some cases, initial pre-treatment by settling or pre-filtration through coarse media is required, but in all cases filtration followed by disinfection is required.

It is likely that a combination of processes will be required to deal with the water quality, for example filtration followed by UV to remove both particles and inactivate microorganisms

The treatments required may be addressed by a multi barrier approach using standalone pollutant-specific treatment processes with each stage treating the water to a suitable quality for subsequent downstream processes (e.g. filtration prior to UV disinfection).

In some cases, it is possible to treat a combination of pollutants simultaneously. There are proprietary systems available which will oxidise and filter iron and manganese within a single unit.

For most elevated groundwater parameters, there are a range of treatment options. For example bacteria can be controlled adequately using either chlorination or Ultraviolet light.

Membrane processes such as reverse osmosis, and specialised filtration processes can control certain bacteria but are not, generally, considered suitable for private water supplies. Water treated by reverse osmosis lacks minerals and the process wastes water. These systems will not be considered further in this assessment.

There are commercially available (single) units which could treat all of the elevated parameters noted in the groundwater and are supplied as a standalone unit. Combination treatments and the maintenance of water treatment equipment is discussed below.

The elevated parameters measured in the groundwater on site are tabulated below alongside potential treatments.

Parameter	Treatment
Ammonium	Chlorination, aeration, ion exchange or dedicated filter
Fe/Mn	Oxidation/filter
Turbidity	Particulate Filter
Bacteria	Chlorination or UV

The treatments are summarised below with a schematic at section 9.7 indicating how the proposed treatments would remove the elevated parameters identified.

The drinking water inspectorate has produced a useful table which summarises the pros and cons and capabilities of some of the widely used available systems. A copy of the private water supply treatment summary table is shown at Appendix 5.

The final choice of the treatment system(s) would lie with the developer and we would recommend that a professional water treatment company is sought and that they should

receive copies of the water quality testing results and proposed abstraction rates to inform their recommendations. The choice of treatments would also be affected by the water flow rate and system pressure. It is important that any such water treatment supplier is informed of the flow and expected demand in order to provide a suitable system.

The drinking water inspectorate has produced a checklist of questions (shown at Appendix 5) to ask an installer regarding treatment solutions.

9.1 Screening Filters

Prior to treatments to remove chemicals, it is necessary to pre-filter the water.

Sediments can be removed in tanks and particulate filters are suited to reduce turbidity and microorganisms or to remove specific inorganic particulates such as iron or manganese compounds.

Sedimentation tanks reduce the velocity of flow of water so as to permit suspended solids to settle under gravity and reduce turbidity. Turbidity can be controlled using slow sand filters, gravel filters and cartridge filters.

Particulate filters are frequently incorporated into proprietary point-of-use devices to protect subsequent processes such as activated carbon filtration or UV disinfection.

Where sufficient space is available, slow sand filters may be suitable for private water supplies.

However, for small private water supplies, turbidity is often treated using cartridge filters consisting of a woven or spun filter or specialised turbidity filters comprising a cylinder with assorted filtration media and which will operate within a broad system pressure range.

9.2 Adsorption filters

Activated carbon removes colour (bad taste and odours) along with contaminants, including suspended solids, pesticides and trihalomethanes from water by physical adsorption. But, when using chlorine as the disinfectant, the activated carbon filter must be downstream of (before) the disinfectant as activated carbon removes chlorine from the water.

9.3 Bacteria

For bacteria control, a disinfecting system, such as a UV sterilisation system or a chlorination system is required.

Disinfection with chlorine is no longer common in small supplies and it can generate harmful compounds which subsequently must also be treated/removed (e.g.THMs).

Ultraviolet irradiation is the most common disinfection method found in private supplies due to a lower retention time requirement. However, prefiltration is generally required prior to UV disinfection as the colour and turbidity of the water affect the efficiency of UV disinfection.

Hygienic storage of UV treated water is paramount since, unlike chlorine treated water, there is no residual disinfectant ability in UV treated water.

9.4 Ammonium, iron and manganese removal

The equilibrium relationship between the gas ammonia and ammonium (ion or soluble salt), is pH dependant and ammonia can be removed from water by aeration (after increasing pH to 11).

Iron and manganese water filters are available to reduce levels of iron and manganese and proprietary ion exchange units are available which remove ammonium ions.

However, iron and manganese removal is generally accomplished simultaneously, usually through precipitation. There are a number of proprietary systems on the market which will oxidise and filter iron and manganese and remove ammonium within a single unit with automated control systems. Such systems require regular maintenance such as backwashing/flushing to regenerate their capabilities.

These parameters would also be controlled through chlorination.

9.5 Water Softeners

If deemed necessary, a water softener is generally installed as a point-of-use treatment installed at the point of supply to treat hard water, but it is noted that point of use devices are not considered appropriate for the treatment of private supplies and that, if required, whole systems units are commercially available.

9.6 Other considerations

Well pump(s)

The well pump must be suitable to provide adequate water pressure for the treatment system installed as an inadequate flow rate or excessive or insufficient pressure may prevent a treatment system operating effectively.

Treated water storage

The water supply system should include treated water storage sufficient to supply treated water at expected rates. Issues to consider include hygiene in the storage tanks and where the final disinfection stage is in relation to treated water

Maintenance

The components of any water treatment system such as filters require cleaning/replacement in accordance with the manufacturer's recommendations or when a decline in water quality is noted.

Proper maintenance involves a combination of regular inspection, testing, and professional servicing along with water quality testing.

The manual on treatment for small water supply systems recommends that an appropriate regulatory monitoring frequency should be set after the installed treatment system can be shown to perform satisfactorily and when there is a maintenance procedure in place which would ensure that any problems are detected at an early stage.

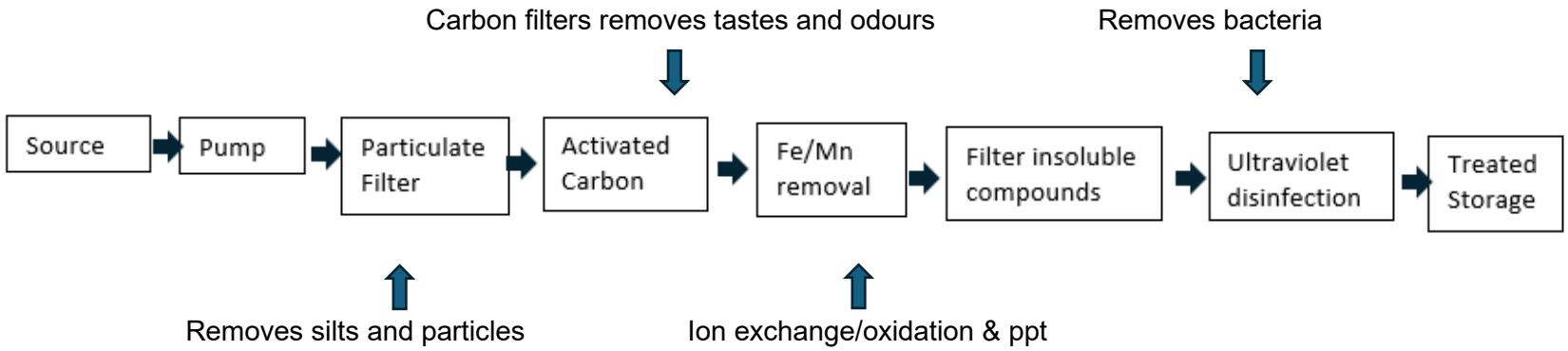
Such a procedure would include checks that UV or other disinfection equipment is operating properly and observation of the performance of any filtration processes being used.

The manual recommends that the maintenance procedure should include a contingency plan for the use of alternative supplies or the instigation of a boil water regime, when necessary, for water used for drinking.

9.7 Schematic of Suitable Water Treatment Train

The multi barrier water treatment system shown below would treat the water to potable standards.

It is noted that compact proprietary commercial multi-parameter treatment systems are also available which can systematically treat water to control varied parameters.



10 SUMMARY

The results of the May 2024 water sampling are consistent with the 2023 dataset and show that there are no significantly elevated levels of contaminants in the groundwater.

The groundwater quality measured on site is consistent with the aquifer baseline.

For measuring volatile compounds, the use of PFAS free bailers and cord was considered preferential to the use of either inertia or electric pumps due to the increased components involved and difficulty determining their PFAS free status. In addition, any overvigorous pumping could cause chemical changes/losses.

Now that it has been shown that the groundwater does not contain PFAS compounds above the screening limit, PFAS compounds can be dropped from any future monitoring suite. It is understood that the Fire Service hold records which confirm PFAS containing materials would not have been used during the historical Thakeham Mushrooms fire.

While not suitable for volatiles, a minimum-purge sampling technique such as low-flow micro purging would be suitable for sampling groundwater which was moving through the well screen under laminar flow conditions for a standard suite of water quality parameters.

The work reported here shows that, following pre-treatment, the use of groundwater on site for potable water is likely feasible. A range of suitable industry standard groundwater treatment options are also shown along with a site specific treatment option from a specialised private water supply treatment company.

The treatment proposal shown at Appendix 6 from Silverline Ltd is based on the volume of water required on site, the volume of the treated water reservoir and the site specific water quality including both the parameters to be treated, their concentrations and groundwater flow rate.

While it is noted that bacteria may have been introduced during sampling, any such water treatment system would include an appropriate disinfection stage

It is noted that before the groundwater on site could ultimately be used for potable supply, the water will have to be sampled and tested to ensure that it is fit for human consumption in accordance with *The Private Water Supplies (England) (Amendment) Regulations 2018)* and in accordance with the private water supplies sampling procedures manual which involves testing from running taps. The collection of investigational samples as reported here, falls outside of the scope of this scheme.


509750
510000
510250
117000
116750
116500
Stream
Stream
BH2
BH1
Pond
TQ01NE89
0
100
200
300
400 m
Contains Ordnance Survey Data (c) Crown Copyright and database right 2024

APPENDIX 1

Borehole Records

Borehole record form

NICHOLLS BOREHOLES & GROUND SOURCE

British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL

Environment Agency

Water Resources Act 1991 (as amended by the Water Act 2003)

A Site details

Borehole drilled for: James Lench

Location: Akehurst homes land off Storrington Rd Thakeham RH20 3EG

NGR (ten digits): _____ Please attach site plan

Ground level (if known): _____ metres Above Ordnance Datum

Drilling company: Nicholls

Date drilling commenced: 25/10/23 (DD/MM/YYYY) Completed: 25/10/23 (DD/MM/YYYY)

B Construction details

Borehole datum (if not ground level): _____ metres (m). Please tick if this is above ☐ or below ☐ ground level.
(point from which all measurements of depth are taken, for example, flange, edge of chamber)

Borehole drilled diameter: 200 mm from 0 to 58.5 m/depth

_____ mm from _____ to _____ m/depth

_____ mm from _____ to _____ m/depth

_____ mm from _____ to _____ m/depth

Casing material and type (for example, if plain steel, plastic slotted). Please record permanent casing details, not temporary casing.

Casing material: solid uPVC diameter: 125 mm from: 0m to: 9.4m m/depth

Casing material: slotted uPVC diameter: 125 mm from: 9.4m to: 55m m/depth

Casing material: solid uPVC diameter: 125 mm from: 55m to: 58m m/depth

Casing material: _____ diameter: _____ mm from: _____ to: _____ m/depth

Grouting details: 55 bags of washed shingle 15 bags of mikolit

Water struck at 1. 28m m (depth below datum - mbd) 2. 52m m (mbd)

3. _____ m (mbd) 4. _____ m (mbd)

C Test pumping summary (Please supply full details on form WR39)

Test pumping datum (if different from borehole datum): _____ m. Please tick if this is above ☐ or below ☐ ground level.

Pump suction depth: _____ mbd

Water level (start of test): _____ mbd

Water level (end of test): _____ mbd

Type of test (for example, bailer, step, constant rate)

_____

Pumping rate: _____ m^3/hour ☐ or litres/second ☐. Please tick as appropriate.

for days, _____ hours, mins

Recovery to _____ mbd in days, _____ hours, mins
(from end of pumping)

Date(s) of measurements: Pump started (DD/MM/YYYY)

Pump stopped _____ (DD/MM/YYYY)

Please supply chemical analysis if available. If you have included this please tick this box ☐

D Strata log

Geological classification (BGS only)	Description of strata	Thickness m	Depth (to base of strata) m
	brown clay 0-3 grey clay 3-28 sandstone with bands of limestone 28-58 grey clay 58-58.5 (continue on separate page if necessary)	3m 25m 30m	
	Other comments (for example, gas encountered, saline water intercepted)		

E Completing this form

How long did it take you to fill in this form? _____

For Official use only

Date received (DD/MM/YYYY)	File	Consent number	BGS reference number
Accession number	Wellmaster number	SOBI number	NGR
LIC NO	Purpose		EA reference number
Copy number	Entered by		

The British Geological Survey will use the information you

Borehole record form

NICHOLLS BOREHOLES & GROUND SOURCE

British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL

Environment Agency

Water Resources Act 1991 (as amended by the Water Act 2003)

A Site details

Borehole drilled for: James Lench

Location: akehurst homes land off Storrington Rd Thakeham RH20 3EG

NGR (ten digits): _____ Please attach site plan

Ground level (if known): _____ metres Above Ordnance Datum

Drilling company: Nicholls

Date drilling commenced: 26/10/23 (DD/MM/YYYY) Completed: 27/10/23 (DD/MM/YYYY)

B Construction details

Borehole datum (if not ground level): _____ metres (m). Please tick if this is above D or below D ground level.
(point from which all measurements of depth are taken, for example, flange, edge of chamber)

Borehole drilled diameter: 200 mm from 0 to 58.5 m/depth

_____ mm from _____ to _____ m/depth

_____ mm from _____ to _____ m/depth

_____ mm from _____ to _____ m/depth

Casing material and type (for example, if plain steel, plastic slotted). Please record permanent casing details, not temporary casing.

Casing material: solid UPVC diameter: 125 mm from: 0 to: 9.4 m/depth

Casing material: slotted UPVC diameter: 125 mm from: 9.4 to: 55 m/depth

Casing material: solid UPVC diameter: 125 mm from: 55 to: 58 m/depth

Casing material: _____ diameter: _____ mm from: _____ to: _____ m/depth

Grouting details: 53 bags of washed shingle 16 bags of mixed

Water struck at 1. 28m m (depth below datum - mbd) 2. 52m m (mbd)

3. _____ m (mbd) 4. _____ m (mbd)

C Test pumping summary (Please supply full details on form WR39)

Test pumping datum (if different from borehole datum): _____ m. Please tick if this is above D or below D ground level.

Pump suction depth: _____ mbd

Water level (start of test): _____ mbd

Water level (end of test): _____ mbd

Type of test (for example, bailer, step, constant rate)

_____

Pumping rate: _____ m^3/hour D or litres/second D. Please tick as appropriate.

for days, _____ _____ hours, mins _____

Recovery to _____ mbd in days, _____ _____ hours, mins _____
(from end of pumping)

Date(s) of measurements: Pump started (DD/MM/YYYY)

Pump stopped _____ (DD/MM/YYYY)

Please supply chemical analysis if available. If you have included this please tick this box D

D Strata log

Geological classification (BGS only)	Description of strata	Thickness m	Depth (to base of strata) m
	brown clay 0-3 grey clay 3-28 sandstone with bands of limestone 28-58 grey clay 58-58.5 (continue on separate page if necessary)	3m 25m 30m	
	Other comments (for example, gas encountered, saline water intercepted)		

E Completing this form

How long did it take you to fill in this form? ____

For Official use only

Date received (DD/MM/YYYY)	File	Consent number	BGS reference number
Accession number	Wellmaster number	SOBI number	NGR
LIC NO	Purpose		EA reference number
Copy number	Entered by		

The British Geological Survey will use the information you

APPENDIX 2

2024 Analytical Testing Results

Kelly Bearman
Ground & Environmental Services Ltd
Unit 2
Montpelier Business Park
Dencora Way
Ashford
Kent
TN23 4FG

Normec DETS Limited
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 24-05740

Site Reference:	None Supplied
Project / Job Ref:	None Supplied
Order No:	GES/5594.13273
Sample Receipt Date:	23/05/2024
Sample Scheduled Date:	24/05/2024
Report Issue Number:	2
Reporting Date:	25/06/2024

Authorised by:

Steve Knight
Customer Support Manager

Dates of laboratory activities for each tested analyte are available upon request.
This report supersedes 24-05740, issue no.1.

Reason for reissue: Turbidity removed as per clients request

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Normec DETS Limited
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

UKAS TESTING 4480

Water Analysis Certificate							
DETS Report No: 24-05740	~Date Sampled	23/05/24	23/05/24			
Ground & Environmental Services Ltd	~Time Sampled	None Supplied	None Supplied			
~Site Reference: None Supplied	~TP / BH No	BH1	BH2			
~Project / Job Ref: None Supplied	~Additional Refs	None Supplied	None Supplied			
~Order No: GES/5594.13273	~Depth (m)	None Supplied	None Supplied			
Reporting Date: 25/06/2024	DETS Sample No	717216	717217			

Determinand	Unit	RL	Accreditation		(hs)			
pH	pH Units	N/a	ISO17025	7.6	7.7			
Sulphate as SO_4	mg/l	< 1	ISO17025	23	24			
Ammonium as NH_4	ug/l	< 50	ISO17025	435	650			
Ammonium as NH_4	mg/l	< 0.05	ISO17025	0.44	0.65			
Chloride	mg/l	< 1	ISO17025	24	24			
Nitrate as NO_3	mg/l	< 0.5	ISO17025	< 0.5	< 0.5			
Nitrite as NO_2	mg/l	< 0.5	NONE	< 0.5	< 0.5			
Phosphate as PO_4	mg/l	< 1	NONE	< 1.0	< 1.0			
Fluoride	mg/l	< 0.5	ISO17025	0.9	0.9			
Hardness - Total	mgCaCO3/l	< 0.25	NONE	202	220			
Chemical Oxygen Demand	mg/l	< 5	ISO17025	10	14			
Total Suspended Solids	mg/l	< 5	NONE	9	10			
Total Chlorine (S)	mg/l	< 0.02	NONE	0.68	< 0.02			
Arsenic (dissolved)	ug/l	< 0.2	ISO17025	1.6	0.6			
Barium (dissolved)	ug/l	< 0.2	ISO17025	133.0	130.0			
Beryllium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2	< 0.2			
Boron (dissolved)	ug/l	< 1	ISO17025	96	96			
Cadmium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2	< 0.2			
Chromium (dissolved)	ug/l	< 0.2	ISO17025	1.7	2.3			
Copper (dissolved)	ug/l	< 0.2	ISO17025	1.4	0.8			
Iron (dissolved)	ug/l	< 1	ISO17025	2619	388			
Lead (dissolved)	ug/l	< 0.2	ISO17025	0.6	0.3			
Mercury (dissolved)	ug/l	< 0.04	ISO17025	< 0.04	< 0.04			
Nickel (dissolved)	ug/l	< 0.2	ISO17025	0.9	0.6			
Selenium (dissolved)	ug/l	< 0.2	ISO17025	0.8	0.5			
Vanadium (dissolved)	ug/l	< 0.2	ISO17025	1.4	1.1			
Zinc (dissolved)	ug/l	< 1	ISO17025	169	224			
Calcium (dissolved)	mg/l	< 0.1	ISO17025	66.4	72.2			
Magnesium (dissolved)	mg/l	< 0.1	ISO17025	8.8	9.5			
Potassium (dissolved)	mg/l	< 0.1	ISO17025	7.7	8.3			
Sodium (dissolved)	mg/l	< 0.1	ISO17025	12	12.9			
Perfluoro-1-butanesulfonate (PFBS) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Perfluorooctanesulfonate (PFOS) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Perfluoro-1-hexanesulfonamide (FHxSA) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Perfluoro-1-heptanesulfonate (PFHpS) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Perfluoro-n-octanoic acid (PFOA) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
1H,1H,2H,2H-perfluoro-1-octanesulfonate (6-2 FTS) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
1H,1H,2H,2H-perfluoro-1-hexanesulfonate (4-2 FTSA) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Dodecafluoro-3H-4,8-dioxanonanoate (DONA) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Perfluorohexanesulfonate (PFHxS) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Perfluoro-n-heptanoic acid (PFHpA) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Perfluoro-n-nonanoic acid (PFNA) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Perfluoro-1-butanesulfonamide (FBSA) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Tetrafluoro-2-(heptafluoropropoxy)-propanoic acid (HFPO-DA) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Perfluoro-1-pentanesulfonate (PFPeS) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Perfluoro-n-hexanoic acid (PFHxA) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
Perfluoro-n-pentanoic acid (PFPeA) (S)	ng/l	< 10	NONE	< 10.0	< 10.0			
E.Coli (S)	mpn/100ml	N/a	ISO17025	0	0.00000			

Subcontracted analysis (S)
Insufficient sample I/S
Unsuitable Sample U/S
~Sample details provided by customer and can affect the validity of results
(hs) Please note deviating sample due to head space in container

Normec DETS Limited
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

UKAS TESTING 4480

Water Analysis Certificate - Volatile Organic Compounds (VOC)						
DETS Report No: 24-05740	~Date Sampled	23/05/24	23/05/24			
Ground & Environmental Services Ltd	~Time Sampled	None Supplied	None Supplied			
~Site Reference: None Supplied	~TP / BH No	BH1	BH2			
~Project / Job Ref: None Supplied	~Additional Refs	None Supplied	None Supplied			
~Order No: GES/5594.13273	~Depth (m)	None Supplied	None Supplied			
Reporting Date: 25/06/2024	DETS Sample No	717216	717217			

Determinand	Unit	RL	Accreditation	(hs)				
Dichlorodifluoromethane	ug/l	< 5	ISO17025	< 5	< 5			
Vinyl Chloride	ug/l	< 5	ISO17025	< 5	< 5			
Chloromethane	ug/l	< 5	ISO17025	< 5	< 5			
Chloroethane	ug/l	< 5	ISO17025	< 5	< 5			
Bromomethane	ug/l	< 5	ISO17025	< 5	< 5			
Trichlorofluoromethane	ug/l	< 5	ISO17025	< 5	< 5			
1,1-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5			
MTBE	ug/l	< 10	ISO17025	< 10	< 10			
trans-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5			
1,1-Dichloroethane	ug/l	< 5	ISO17025	< 5	< 5			
cis-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5			
2,2-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5			
Chloroform	ug/l	< 5	ISO17025	< 5	< 5			
Bromochloromethane	ug/l	< 10	ISO17025	< 10	< 10			
1,1,1-Trichloroethane	ug/l	< 5	ISO17025	< 5	< 5			
1,1-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5			
Carbon Tetrachloride	ug/l	< 5	ISO17025	< 5	< 5			
1,2-Dichloroethane	ug/l	< 10	ISO17025	< 10	< 10			
Benzene	ug/l	< 1	ISO17025	< 1	< 1			
1,2-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5			
Trichloroethene	ug/l	< 5	ISO17025	< 5	< 5			
Bromodichloromethane	ug/l	< 5	ISO17025	< 5	< 5			
Dibromomethane	ug/l	< 5	ISO17025	< 5	< 5			
TAME	ug/l	< 5	ISO17025	< 5	< 5			
cis-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5			
Toluene	ug/l	< 5	ISO17025	< 5	< 5			
trans-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5			
1,1,2-Trichloroethane	ug/l	< 10	ISO17025	< 10	< 10			
1,3-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5			
Tetrachloroethene	ug/l	< 5	ISO17025	< 5	< 5			
Dibromochloromethane	ug/l	< 5	ISO17025	< 5	< 5			
1,2-Dibromoethane	ug/l	< 5	ISO17025	< 5	< 5			
Chlorobenzene	ug/l	< 5	ISO17025	< 5	< 5			
1,1,1,2-Tetrachloroethane	ug/l	< 5	ISO17025	< 5	< 5			
Ethyl Benzene	ug/l	< 5	ISO17025	< 5	< 5			
m,p-Xylene	ug/l	< 10	ISO17025	< 10	< 10			
o-Xylene	ug/l	< 5	ISO17025	< 5	< 5			
Styrene	ug/l	< 5	ISO17025	< 5	< 5			
Bromoform	ug/l	< 10	ISO17025	< 10	< 10			
Isopropylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
1,1,2,2-Tetrachloroethane	ug/l	< 10	ISO17025	< 10	< 10			
1,2,3-Trichloropropane	ug/l	< 5	ISO17025	< 5	< 5			
n-Propylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
Bromobenzene	ug/l	< 5	ISO17025	< 5	< 5			
2-Chlorotoluene	ug/l	< 5	ISO17025	< 5	< 5			
1,3,5-Trimethylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
4-Chlorotoluene	ug/l	< 5	ISO17025	< 5	< 5			
tert-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
1,2,4-Trimethylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
sec-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
p-Isopropyltoluene	ug/l	< 5	ISO17025	< 5	< 5			
1,3-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5			
1,4-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5			
n-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
1,2-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5			
,2-Dibromo-3-chloropropane	ug/l	< 10	ISO17025	< 10	< 10			
Hexachlorobutadiene	ug/l	< 5	ISO17025	< 5	< 5			

~Sample details provided by customer and can affect the validity of results
(hs) Please note deviating sample due to head space in container

Normec DETS Limited
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Water Analysis Certificate - Speciated Phenols						
DETS Report No: 24-05740	~Date Sampled	23/05/24	23/05/24			
Ground & Environmental Services Ltd	~Time Sampled	None Supplied	None Supplied			
~Site Reference: None Supplied	~TP / BH No	BH1	BH2			
~Project / Job Ref: None Supplied	~Additional Refs	None Supplied	None Supplied			
~Order No: GES/5594.13273	~Depth (m)	None Supplied	None Supplied			
Reporting Date: 25/06/2024	DETS Sample No	717216	717217			

Determinand	Unit	RL	Accreditation	(hs)				
2, 3, 5-trimethylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2, 3, 6-trimethylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2, 3-xylenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2, 4, 6-trimethylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2, 4-xylenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2, 5-xylenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2, 6-xylenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2-ethylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2-isopropylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
3, 4, 5-trimethylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
3, 4-xylenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
3, 5-xylenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
3-ethylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
3-isopropylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-ethylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-isopropylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
m-cresol (3-methylphenol)	ug/l	< 0.1	NONE	< 0.1	< 0.1			
o-cresol (2-methylphenol)	ug/l	< 0.1	NONE	< 0.1	< 0.1			
p-cresol (4-methylphenol)	ug/l	< 0.1	NONE	< 0.1	< 0.1			
phenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			

~Sample details provided by customer and can affect the validity of results
(hs) Please note deviating sample due to head space in container

Normec DETS Limited
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Water Analysis Certificate - Organochlorine Pesticides						
DETS Report No: 24-05740	~Date Sampled	23/05/24	23/05/24			
Ground & Environmental Services Ltd	~Time Sampled	None Supplied	None Supplied			
~Site Reference: None Supplied	~TP / BH No	BH1	BH2			
~Project / Job Ref: None Supplied	~Additional Refs	None Supplied	None Supplied			
~Order No: GES/5594.13273	~Depth (m)	None Supplied	None Supplied			
Reporting Date: 25/06/2024	DETS Sample No	717216	717217			

Determinand	Unit	RL	Accreditation	(hs)				
Aldrin	ug/l	< 0.02	NONE	< 0.02	< 0.02			
alpha-HCH	ug/l	< 0.02	NONE	< 0.02	< 0.02			
beta-HCH	ug/l	< 0.02	NONE	< 0.02	< 0.02			
cis-chlordane	ug/l	< 0.02	NONE	< 0.02	< 0.02			
delta-HCH	ug/l	< 0.02	NONE	< 0.02	< 0.02			
Dieldrin	ug/l	< 0.02	NONE	< 0.02	< 0.02			
Endosulfan A	ug/l	< 0.02	NONE	< 0.02	< 0.02			
Endosulfan B	ug/l	< 0.02	NONE	< 0.02	< 0.02			
Endrin	ug/l	< 0.02	NONE	< 0.02	< 0.02			
gamma-HCH (Lindane)	ug/l	< 0.02	NONE	< 0.02	< 0.02			
Heptachlor	ug/l	< 0.02	NONE	< 0.02	< 0.02			
Heptachlor epoxide	ug/l	< 0.02	NONE	< 0.02	< 0.02			
Hexachlorobenzene (HCB)	ug/l	< 0.02	NONE	< 0.02	< 0.02			
Isodrin	ug/l	< 0.02	NONE	< 0.02	< 0.02			
Methoxychlor	ug/l	< 0.02	NONE	< 0.02	< 0.02			
o,p' - DDD	ug/l	< 0.02	NONE	< 0.02	< 0.02			
o,p' - DDE	ug/l	< 0.02	NONE	< 0.02	< 0.02			
o,p' - DDT	ug/l	< 0.02	NONE	< 0.02	< 0.02			
p,p' - DDD	ug/l	< 0.02	NONE	< 0.02	< 0.02			
p,p' - DDE	ug/l	< 0.02	NONE	< 0.02	< 0.02			
p,p' - DDT	ug/l	< 0.02	NONE	< 0.02	< 0.02			
trans-chlordane	ug/l	< 0.02	NONE	< 0.02	< 0.02			
Trifluralin	ug/l	< 0.02	NONE	< 0.02	< 0.02			

~Sample details provided by customer and can affect the validity of results
(hs) Please note deviating sample due to head space in container

Normec DETS Limited
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

UKAS TESTING 4480

Water Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 24-05740
Ground & Environmental Services Ltd
~Site Reference: None Supplied
~Project / Job Ref: None Supplied
~Order No: GES/5594.13273
Reporting Date: 25/06/2024

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	U	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	UF	Biological Oxygen Demand (COD)	Determination using BOD sensors measuring the change of pressure	E133
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR dete	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 – C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichlorometha	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered
~Sample details provided by customer and can affect the validity of results

Kelly Bearman
Ground & Environmental Services Ltd
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TN23 4FG

Normec DETS Limited
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 24-06732

Site Reference:	None Supplied
Project / Job Ref:	None Supplied
Order No:	GES/5594.13273
Sample Receipt Date:	23/05/2024
Sample Scheduled Date:	17/06/2024
Report Issue Number:	1
Reporting Date:	21/06/2024

Authorised by:

Steve Knight
Customer Support Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Normec DETS Limited
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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

UKAS TESTING 4480

Water Analysis Certificate							
DETS Report No: 24-06732	~Date Sampled	None Supplied	None Supplied			
Ground & Environmental Services Ltd	~Time Sampled	None Supplied	None Supplied			
~Site Reference: None Supplied	~TP / BH No	BH1	BH2			
~Project / Job Ref: None Supplied	~Additional Refs	None Supplied	None Supplied			
~Order No: GES/5594.13273	~Depth (m)	None Supplied	None Supplied			
Reporting Date: 21/06/2024	DETS Sample No	721221	721222			

Determinand	Unit	RL	Accreditation	(^)	(^)			
Manganese (dissolved)	ug/l	< 0.2	ISO17025	13.5	14.2			

Subcontracted analysis (S)
Insufficient sample I/S
Unsuitable Sample U/S
~Sample details provided by customer and can affect the validity of results

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UKAS TESTING 4480

Water Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 24-06732
Ground & Environmental Services Ltd
~Site Reference: None Supplied
~Project / Job Ref: None Supplied
~Order No: GES/5594.13273
Reporting Date: 21/06/2024

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	U	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	UF	Biological Oxygen Demand (COD)	Determination using BOD sensors measuring the change of pressure	E133
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by c	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detec	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 – C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethan	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered
~Sample details provided by customer and can affect the validity of results

APPENDIX 3

2023 Analytical Testing Results

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LABORATORY REPORT - Page 1 of 2

Client:	Nicholls Boreholes	**Certificate No:**	23240815-1
	Brownings Barn	**Order No:**	BH1499 BH1
	Glass House Lane	**Date Reported:**	06/12/2023
	Kirdford	**Site Name:**	BH1499 BH1
	RH14 0LW	**Sample Desc:**	Bottom of field

Test	Results	Limit	Units	Comment	Sample Details	
Alkalinity	281	-	mg/l			
Aluminium	<20.00	200	µg/l			
Ammonium	0.169	0.5	mg/l		**Sampling Date:**	30/11/2023
Boron	<50.00	1000	µg/l		**Sampling Time:**	-
Calcium	140.8	-	mg/l		**Date Received:**	01/12/2023
Chloride	47.3	250	mg/l		**Date Tested:**	01/12/2023
Copper	<100.00	2000	µg/l			
Fluoride	190	1500	ug/l			
Dissolved Iron (Fe II)	<10.00	-	µg/l			
Total Iron (FeII+FeIII)	856	200	µg/l	*		
Lead	<2.00	10	µg/l			
Magnesium	3.89	-	mg/l			
Manganese	56	50	µg/l	*		
Nitrate	<22.00	50	mg/l			
Nitrite	<50.00	500	µg/l			
Nitrite/Nitrate	0.1	≤1	-			
Phosphate	<0.15	-	mg/l			
Potassium	10.1	-	mg/l			
Sodium	35	200	mg/l			
Sulphate	69.5	250	mg/l			
Electrical Conductivity	746	2500	µS/cm			
Calcium Hardness	352	-	mg/l			
Total Hardness as CaCO3	368	-	mg/l	V Hard		
Magnesium Hardness	16	-	mg/l			
pH	6.94	6.5-9.5	pH units			
Total Dissolved Solids	365	-	mg/l			
Turbidity	7.81	4	NTU	*		

Disclaimers:

The results provided are not UKAS accredited and can only be used for non-regulatory purposes

*** Denotes concentrations above UK drinking water standards**

 # Denotes results which must be treated with caution due to sampling, transit or storage issues prior to delivery to laboratory

</> Denotes concentration found within sample below/above the equipment's detection level

∞ Indicates test has been repeated due to uncertainty or testing issues

$ Indicates sample was tested outside of the stability period, validity of results may be affected

All analytical quality control associated with these results was satisfactory, details are available on request

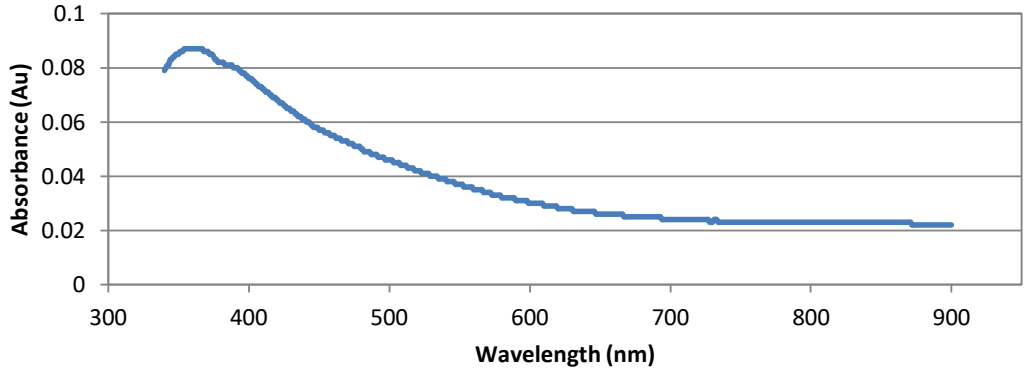
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LABORATORY REPORT - Page 2 of 2

Client:	Nicholls Boreholes	**Certificate No:**	23240815-1
	Brownings Barn	**Order No:**	BH1499 BH1
	Glass House Lane	**Date Reported:**	06/12/2023
	Kirdford	**Site Name:**	BH1499 BH1
	RH14 0LW	**Sample Desc:**	Bottom of field

Test	Results	Limit	Units	Comment	Sample Details	
E.coli	1	0	cfu/100ml	*	Sampling Date:	30/11/2023
Total Coliforms	22	0	cfu/100ml	*	Sampling Time:	-
Enterococci	1	0	cfu/100ml	*	Date Received:	01/12/2023
TVC 3 at 22°C	>300	no abnormal change	cfu/ml		Date Tested:	01/12/2023
TVC 2 at 37°C	>300		cfu/ml			

Absorbance vs. Wavelength



Patrycja Malinowska
Laboratory Manager

Disclaimers:

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LABORATORY REPORT - Page 1 of 2

Client: Nicholls Boreholes
Brownings Barn
Glass House Lane
Kirdford
RH14 0LW

Certificate No: 23240815-2
Order No: BH1499 BH12
Date Reported: 06/12/2023
Site Name: BH1499 BH2
Sample Desc: by gate

Test	Results	Limit	Units	Comment	Sample Details	
Alkalinity	318	-	mg/l			
Aluminium	<20.00	200	µg/l			
Ammonium	0.141	0.5	mg/l		**Sampling Date:**	30/11/2023
Boron	<50.00	1000	µg/l		**Sampling Time:**	-
Calcium	150.8	-	mg/l		**Date Received:**	01/12/2023
Chloride	50.3	250	mg/l		**Date Tested:**	01/12/2023
Copper	<100.00	2000	µg/l			
Fluoride	111	1500	ug/l			
Dissolved Iron (Fe II)	99	-	µg/l			
Total Iron (FeII+FeIII)	1050	200	µg/l	*		
Lead	<2.00	10	µg/l			
Magnesium	5.10	-	mg/l			
Manganese	42	50	µg/l			
Nitrate	<22.00	50	mg/l			
Nitrite	<50.00	500	µg/l			
Nitrite/Nitrate	0.1	≤1	-			
Phosphate	<0.15	-	mg/l			
Potassium	9.8	-	mg/l			
Sodium	38	200	mg/l			
Sulphate	68.1	250	mg/l			
Electrical Conductivity	823	2500	µS/cm			
Calcium Hardness	377	-	mg/l			
Total Hardness as CaCO3	398	-	mg/l	V Hard		
Magnesium Hardness	21	-	mg/l			
pH	6.92	6.5-9.5	pH units			
Total Dissolved Solids	403	-	mg/l			
Turbidity	9.77	4	NTU	*		

Disclaimers:

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*** Denotes concentrations above UK drinking water standards**

 # Denotes results which must be treated with caution due to sampling, transit or storage issues prior to delivery to laboratory

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∞ Indicates test has been repeated due to uncertainty or testing issues

$ Indicates sample was tested outside of the stability period, validity of results may be affected

All analytical quality control associated with these results was satisfactory, details are available on request

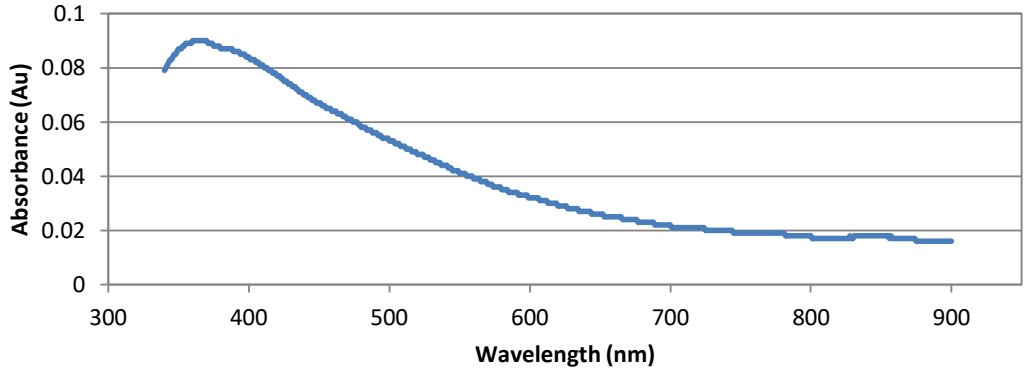
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LABORATORY REPORT - Page 2 of 2

Client:	Nicholls Boreholes	**Certificate No:**	23240815-2
	Brownings Barn	**Order No:**	BH1499 BH12
	Glass House Lane	**Date Reported:**	06/12/2023
	Kirdford	**Site Name:**	BH1499 BH2
	RH14 0LW	**Sample Desc:**	by gate

Test	Results	Limit	Units	Comment	Sample Details	
E.coli	0	0	cfu/100ml		Sampling Date:	30/11/2023
Total Coliforms	3	0	cfu/100ml	*	Sampling Time:	-
Enterococci	0	0	cfu/100ml		Date Received:	01/12/2023
TVC 3 at 22°C	>300	no abnormal change	cfu/ml		Date Tested:	01/12/2023
TVC 2 at 37°C	35		cfu/ml			

Absorbance vs. Wavelength



Patrycja Malinowska
Laboratory Manager

Disclaimers:

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All analytical quality control associated with these results was satisfactory, details are available on request

APPENDIX 4

Aquifer baseline median range of concentrations

Table 6.2 **Median and range of concentrations for groundwaters in the different aquifer units of the Lower Greensand.**

		Hythe			Folkestone			Confined Folkestone		
	units	minimum	median	maximum	minimum	median	maximum	minimum	median	maximum
T	°C	7.2	**10.8**	19.5	10.6	**11.1**	13.5	12.0	**19.9**	23.0
pH	field	5.80	**7.20**	8.10	6.02	**6.60**	7.90	7.10	**7.74**	8.00
Eh	mV	60	**144**	641	116	**335**	465	-52	**10.5**	48
DO	mg l^{-1}	<0.1	**0.2**	9.85	0.42	**1.8**	13	<0.1	**0.175**	0.5
SEC	µS cm^{-1}	109	**315**	827	157	**463**	632	267	**459**	562
$\delta^{18}O$	‰	-7.4	**-7.1**	-6.7	-7.1	**-7.1**	-7.1	-8.1	**-7.9**	-7.6
$\delta^{13}C$	‰	-16.0	**-14.4**	-11.2	-12.4	**-12.4**	-12.4	-18.1	**-12.9**	-12.4
Ca	mg l^{-1}	9.3	**52.4**	182	16.6	**79.7**	109	9.5	**12.7**	30
Mg	mg l^{-1}	1.4	**2.76**	7.17	1.6	**4.1**	5.19	2	**2.71**	6.4
Na	mg l^{-1}	5	**9.85**	21	6.1	**11.6**	21.4	20	**89.8**	111
K	mg l^{-1}	0.94	**2.3**	8.6	1.2	**2.8**	20	4.14	**5.15**	6.8
Cl	mg l^{-1}	10.9	**19**	82	9.6	**20**	43.5	10	**56**	78.9
SO_4	mg l^{-1}	6.9	**21.3**	182	9.5	**48.0**	67	14.3	**16.3**	39.3
HCO_3	mg l^{-1}	6	**148**	339	33	**147**	202	131	**143**	248
NO_3 as N	mg l^{-1}	<0.003	**0.196**	15.8	0.141	**4.25**	16.3	<0.003	**0.02**	0.035
NO_2 as N	mg l^{-1}	<0.001	**0.002**	0.035	<0.001	**0.004**	0.1	<0.001	**0.5**	0.004
NH_4 as N	mg l^{-1}	<0.003	**0.03**	1.36	0.003	**0.03**	1.2	0.152	**0.225**	0.298
P	mg l^{-1}	<0.02	**0.04**	0.31	<0.02	<0.02	<0.02	<0.02	**0.025**	0.035
DOC	mg l^{-1}	0.74	**2.4**	10.1	1.1	**4**	6.9	1.5	**2.95**	7.6
F	mg l^{-1}	0.03	**0.13**	0.27	0.05	**0.15**	0.24	0.07	**0.27**	0.37
Br	mg l^{-1}	0.015	**0.068**	0.17	0.03	**0.077**	0.11	0.1	**0.29**	0.37
I	mg l^{-1}	0.001	**0.003**	0.03	0.003	**0.005**	0.023	0.011	**0.0305**	0.041
Si	mg l^{-1}	4.8	**7.54**	13.2	3.49	**5.1**	5.92	4.7	**5.23**	6.07
Al	µg l^{-1}	0.5	**1**	246	0.5	**40.3**	80	0.5	**0.5**	0.5
As	µg l^{-1}	0.4	**2**	20	0.5	**6.5**	14	2	**5**	7
B	µg l^{-1}	10	**10**	36	10	**20.5**	44	77	**146**	150
Ba	µg l^{-1}	3.53	**105**	380	10	**16.5**	189	15.11	**43.7**	55.3
Co	µg l^{-1}	0.01	**0.02**	2.03	0.01	**1.9**	3.79	0.01	**0.01**	0.01
Cr	µg l^{-1}	0.25	**0.5**	8.5	0.5	**1.15**	5.8	0.25	**0.6**	1
Fe	µg l^{-1}	0.9	**200**	6250	2.5	**65**	420	140	**185**	254
Li	µg l^{-1}	2	**5**	12	3	**5**	8	22.6	**25.8**	32
Mn	µg l^{-1}	0.4	**14**	146	1.2	**33**	100	8	**11**	30
Ni	µg l^{-1}	0.1	**2.8**	22	0.1	**5**	10.9	0.1	**0.1**	5
Pb	µg l^{-1}	0.05	**0.6**	8.6	0.05	**0.4**	0.6	0.05	**0.05**	2
Rb	µg l^{-1}	0.96	**2.12**	10.17	1.25	**1.66**	2.06	2.56	**3.575**	4.26
Sr	µg l^{-1}	30	**117**	588	39.13	**202**	310	400	**544**	3110
Y	µg l^{-1}	0.005	**0.005**	0.83	0.03	**2.86**	5.68	0.01	**0.01**	0.01
Zn	µg l^{-1}	2	**22.8**	215	2	**12**	122	5	**42**	63.1

APPENDIX 5

Drinking Water Inspectorate Guidance for Private Water Supplies

Comparison of treatment capabilities and verification of treatment solutions

Type of Treatment	Description	Contaminants treated	Uses	Advantages	Disadvantages
Particulate Filters.	Filters of pleated papers, woven cartridges or ceramic candles.	Particulate matter (colour, turbidity)	To reduce discolouration and prepare water for further treatment	Simple, easy to use, no chemicals involved	Prone to blockage, can contaminate water with bacteria as bacteria can grow within the filters.
Activated carbon.	Utilisation of activated carbon to adsorb chemicals.	Colour, taste, odour, pesticides THMs. Will act as a physical filter to remove particles	Effective against target contaminants	Small, easy to use, no chemicals involved	Taste and odour from bacteria growth on the filter if not changed frequently enough.
Reverse osmosis units.	Physical filter	Usually used for chemicals which are difficult to remove with other treatments systems. Can be different pore size.	Usually used at point of use and blended with non-filtered water	Effective	Lots of waste water produced. Reduces minerals in the water to unacceptable levels. Can reduce pH to a level which corrodes pipework.
Ion exchange units.	Swaps target contaminants on a media for anions or cations. Typically used in domestic water softeners.	Normally hardness and nitrate but different resins can be supplied for specific contaminants.	Typically used for hardness or nitrate removal	Excellent system for removal of nitrates.	Requires periodic backwash to regenerate resin. Requires replenishment of the salts periodically
Chlorine disinfection	Killing of micro-organisms through timed exposure to a chlorine dose	Bacteria and other microorganisms	Good for large supplies or supplies with a long network where the presence of a disinfectant residual is beneficial	Well-understood technology	Requires storage and use of chemicals, pH might need to be adjusted, requires contact time with the chlorine.. May require a pre filtration stage.
Ultraviolet disinfection (UV).	The passing of the UV light through the water to kill micro-organisms.	Bacteria and other microorganisms	Widely used. Can be particularly effective at inactivating Cryptosporidium.	Effective for the killing of micro-organisms.	Requires regular cleaning and bulb replacement, and an electricity supply. May require a pre filtration stage as ineffective if water is turbid or highly coloured.
Iron and/or manganese removal	Oxidation of iron/manganese in water followed by filtration to remove it	Iron and/or manganese	Removal of iron/manganese	Often supplied as a single proprietary unit. Uses air for oxidation	Requires periodic backwash (although this may be automated)

Checklist of questions to ask an installer regarding treatment solutions

1. Do you have experience of this type of installation?
2. What information would you need to know (or did you use) about raw water quality prior to selecting a treatment system?
3. What information would you need to know (or did you use) about flows and demand prior to selecting a treatment system?
4. What did the risk assessment identify as potential contaminants?
5. Do you only install Regulation 5 approved treatment systems and components?
6. What pre-treatment might be required?
7. How will I know if there's a problem with the treatment system?
8. What ongoing maintenance will be or is required for the system?
9. How will you confirm the system is effective?
10. Will a warranty be provided for the system?
11. How much will the system cost to run?
12. Will you show me how to operate the system?
13. Will you provide an operating manual for me to keep?
14. Do you offer a maintenance contract?
15. How long will the system last?
16. How big will the system be? What system is recommended?

APPENDIX 6

Suitable Commercial Systems for Development Proposal

Kelly Bearman

From: James <James@akehursthomes.co.uk>
Sent: 25 June 2024 06:24
To: Kelly Bearman
Subject: Fwd: AL101 Invoice 303 from Nicholls Licensing Ltd

Hi Kelly,

Can you include this on your report ?

Kind regards

James
Sent from my iPhone

Begin forwarded message:

> **From:** martin@silverlineuk.co.uk
> **Date:** 24 June 2024 at 21:13:54 BST
> **To:** James <James@akehursthomes.co.uk>
> **Subject: RE: AL101 Invoice 303 from Nicholls Licensing Ltd**

Silverline
Manufacturers and Retailers of Domestic & Commercial Water Treatment Equipment
Filters, Cartridges, Ultraviolet, Reverse Osmosis, Softeners, Accessories and much more!

Silverline UK Ltd, Whitemoor, Iddesleigh, Winkleigh, Devon. EX19 8BN

Telephone: +44(0)1805 804202
Fax: +44(0)1805 804680
Website: www.silverlineuk.co.uk

Hi James

Thanks for your enquiry and for your time on the phone earlier.

Both boreholes are very simular in the water quality which means we can treat them both together.

I would suggest fitting a pump in each borehole each capable of providing a flow rate to the tank of 2 m3 per hour each

Both these pumps will be controlled by a float switch in the tank and the pH will be treated between the boreholes and the tank in a common line. Each of these pumps can be monitored so if there is a problem the problem will be picked up straight away and the other pump can easily supply the daily demand duty.

If you were to only use 1 bore hole then swap to the other in the event of problems the water quality would be very bad and as the borehole pump hadnt been used for a while it might not work.

The water will then go int a 20 m3 storage tank where it will have air pumped through it to oxidise the iron and manganese in the water. From here it will be pumped out of the first tank through 2 filters fitted in paraell to remove the iron and manganese then into a second treated water storage tank.

The treated water storage tank will also have an aereator to keep the watetr fresh.

The water will then be pumped out of this tank through a UV sterilise then off to service.

Please see the costs below:

1 X 1.5" pulse water meter [redacted]
This detects when the water is flowing and signals to the dosing pump when to it needs to run

1 X pH dosing system [redacted]
This will automaticall inject the buffer soloution into the feed pipe to the primary storage tank

1 X 20 m3 water storage tank £sourced locally

2 X in tank aereators [redacted] each
These are to oxidise the iron and manganese in the water and to remove any gas from the water

1 X Lowara 1.1 kw variable speed booster pump [redacted]
This pump is fully variable speed it also has stainless steel internals so it wont be damaged by the abrasive iron in the water

1 X Run dry protection float switch [redacted]

If you prefer we could use 2 separate slightly smaller pumps for this so you would have a duty and assist incase of any problems but I would size the pumps so they could cover the whole duty if needed.

2 X 10"x 54" 1.4EOM iron and manganese filters [redacted] each

2 X Aux connections [redacted] each
These give a signal when the valve is in backwash mode so the solonoid valve can close off the supply to the storage tank

2 X 1" solonoid valves [redacted] each

2 X Solonoid power packs [redacted] each

1 X 20 m3 treated water storage tank £sourced locally

2 X in tank aereators [redacted] each

1 X lowara variable speed booster set [redacted]
This pump is fully variable speed and capable of supplying a flow rate of up to 350 lpm @ 5 bar

1 X Run dry protection float switch [redacted]

Once again if prefered we could downsize this pump for two pumps that would cover the required duty each so you will have a duty assist pair of pumps that either of the pumps can supply the whole duty if required

2 X UV-CS440 288 lpm UV steriliser units fitted in paraell £[redacted] each

16 X Aux connections £[redacted] each
Thes connetions go 240 V live in the event of a problem with the unit. This signal can be used to close a solonoid to shut down the supply from that unit or to send a text to an engineer or just to signal an alarm beacn on the treatment building to show the unit needs attention.

After the above treatment the water will be up to drinking water standards.

If you need any further details or would like to discuss anything please do not hesitate to contact us.

All prices are subject to carriage + vat at the standard rate. Quotation valid for 30 days then subject to confirmation. E & OE.

Kind regards,

Martin Goddard

Silverline UK Ltd
Telephone: 01805 804202
Email: martin@silverlineuk.co.uk

DIRECTORS: M. C. GODDARD, J.GODDARD (SECRETARY) REG CARDIFF 2481320 VAT REG NO. 568 8899 44
REGISTERED OFFICE: Silverline UK Ltd, Whitemoor, Iddesleigh, Winkleigh, Devon. EX19 8BN

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From: James <James@akehursthomes.co.uk>
Sent: 21 June 2024 13:01
To: martin@silverlineuk.co.uk
Subject: FW: AL101 Invoice 303 from Nicholls Licensing Ltd

Hi Martin,

HIA report and appendix together with the site layout.

Kind regards

James