WATER NEUTRALITY STATEMENT FOR THE PROPOSED DEVELOPMENT AT THAKEHAM TILES LTD, HEATH COMMON, STORRINGTON, WEST SUSSEX, RH20 3AD.

Issued: 31 October 2025
Client: Thakeham Tiles Ltd
Reference: 20241115P1
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Executive Summary

H2Ogeo provided this Water Neutrality Statement to accompany an outline planning application at Thakeham Tiles' site on Rock Road in Storrington West Sussex.

The application is for the demolition of the existing manufacturing facility and the construction of 108 residential dwellings. The site lies within the Sussex North Water Resource Zone (WRZ), an area that is subject to water neutrality requirements due to the potential adverse effects from groundwater abstraction on the Arun Valley's protected habitats.

The Thakeham Tiles site is located near Storrington, surrounded by woodland and farmland, and has historically been used for sand extraction and concrete tile manufacturing since the 1930s. The current site comprises hardstanding, buildings, storage areas, and raised woodland banks. The proposed redevelopment involves replacing the industrial infrastructure with residential properties ranging from one to four bedroom properties.

There is a current baseline water consumption on site of c6m^3/day however, for conservatism and due to the proposed mitigation strategy, the existing demand and baseline water consumption has been taken as 0 Litres/Day.

The future water use, based on Horsham District Council's guidance and the Part G water efficiency calculations, totals 24.4m^3/day.

To achieve water neutrality, mitigation is required. The site is an allocated site in the Thakeham Neighbourhood Plan January 2017 and therefore qualifies for the Sussex North Water Certification Scheme (SNWCS), formerly SNOWS.

The proposed strategy involves using an on-site groundwater borehole to supply water to the development.

The borehole has been tested for water quality and recommendations made for treatment. Constant rate testing took place following a period of step testing and demonstrates that the borehole can provide a sustainable yield well in excess of the 24.4m3/day demand.

The abstraction is currently under the Environment Agency's abstraction licensing process and has been validated as an application: NPS/WR/043620.

The Water Neutrality Statement concludes that the proposed development at Thakeham Tiles will not increase water abstraction from the Sussex North WRZ. The borehole supply system, supported by sound hydrogeological evidence fully offsets the projected water demand.

Baseline Consumption (L/Day)	*Proposed Consumption (L/Day)*	*Mitigation – Licensed Groundwater Abstraction (L/Day)*	*Water Neutral*
0	24,400	52,500	YES

In the event the borehole solution is not progressed at Reserved Matters stage, the SNWCS will be used to achieve water neutrality on site. As an allocated site, it is deemed eligible for SNWCS credits and it is requested that access to the scheme is granted in principle now, with confirmation to be provided at Reserved Matters stage if the credits are to be required.

The proposed outline development is deemed water neutral and will not contribute to an existing adverse effect upon the integrity of the internationally designated Arun Valley Special Area of Conservation, Special Protection Area and Ramsar sites by way of increased water abstraction.

1 Introduction

Natural England cannot, with certainty, conclude that the Sussex North Water Supply Zone, that includes water supply from a groundwater abstraction, is not having an adverse effect on the integrity of:

- Arun Valley Special Area Conservation (SAC);
- Arun Valley Special Protection Area (SPA); and
- Arun Valley Ramsar Site.

Natural England have advised that developments within this zone must not add to this impact.

The Local Planning Authority (LPA) have requested a Water Neutrality Statement is provided to accompany planning applications to demonstrate that the proposed development does not increase the rate of water abstraction for drinking water supplies above existing levels.

1.1 Scope of Work

H2Ogeo was contacted by the Client and requested to provide a proposal for a Water Neutrality Statement to support a proposed planning application to be submitted to Horsham District Council (HDC) Local Planning Authority (LPA).

The Water Neutrality Statement aims to demonstrate that the proposed development will not *contribute to an existing adverse effect upon the integrity of the internationally designated Arun Valley Special Area of Conservation, Special Protection Area and Ramsar sites by way of increased water abstraction.*

The proposal was accepted and the Water Neutrality Statement is presented in this report.

A Statement of Limitations is presented at the start of this report.

1.2 Background

This Water Neutrality Statement (WNS) has been provided to support an outline planning application for the demolition of all existing buildings, erection of 108 dwellings with associated works at the Thakeham Tiles site, near Storrington in West Sussex.

A planning drawing is presented in Annex A showing the proposed layout of the development and the site location is presented in Figure 1.

1.3 Sussex North Water Resource Zone (WRZ)

Southern Water supplies water to Crawley Borough, Horsham District, the northern part of Chichester District, southern Waverley and the South Downs National Park from its Sussex North Water Resource Zone (WRZ).

Within the WRZ there are a number of water sources, one of which is the groundwater abstraction from the Hardham source, one of a number of groundwater and surface water abstractions around Pulborough[1] presented in Figure 2 along with the proposed site and boundary of the Sussex North WRZ

The Hardham Groundwater abstraction is located approximately 7.5km west-north-west of the proposed site.

[1] https://www.horsham.gov.uk/__data/assets/pdf_file/0019/104482/EYP-JBAU-XX-XX-RP-EN-0001-A1-C03-Water_Neutrality_Assessment_Part_A.pdf

2 Site Location and Setting

The site is located in a rural area of the Weald, approximately 1.6km north east of the village of Storrington. It is accessed off the southern side of Rock Road, surrounded by woodlands and residential properties in the east, south and west and the road and agricultural fields to the north.

The site is centred on National Grid Reference TQ 10432 14949 (Easting: 510432, Northing: 114949).

The site location and red-line boundary is presented in Figure 1.

2.1 Existing Site

The existing site is a long-established manufacturing facility specialising in concrete products ranging from decorative walling and block paving to building blocks and slabs. It has been in operation since the early 1930s where it was originally used for sand extraction, with materials now being sourced from local suppliers.

There are significant level changes within the site and on adjacent land, around the southern part of the site, former sand extraction activity has created raised banked areas, now covered by self-sown coniferous woodland[2].

The buildings on site consist of a site office, production sheds, workshops, compressor shed and curing bays. Areas of the site are hard-standing with a level area in the north of the site used for storage, deliveries and collections.

2.2 Proposed Development

The proposed development is for the demolition of the existing buildings and construction of 108 residential homes, ranging from one to four-bedroom properties.

The table below shows a summary of the proposed bedroom numbers and the layout is presented in Annex A.

Table 1 Proposed Properties

Bedroom No'	***Number of Properties***
1	6
2	35
3	55
4	12
Total	108

[2] Planning Application DC/18/2095

3 Environmental Setting

3.1 Geology in the Arun Valley at Hardham

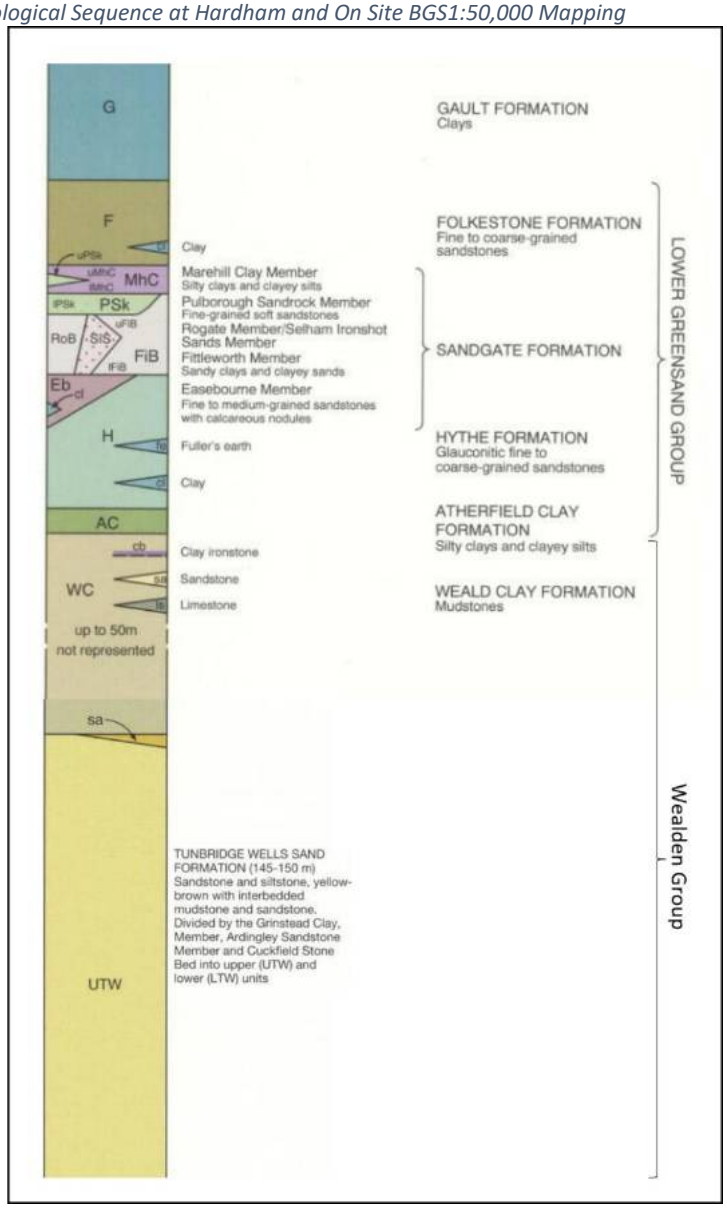
The Hardham Abstraction consists of a series of boreholes and surface water supplies that abstract groundwater from the Folkestone Formation, part of the Lower Greensand Formation bedrock geology.

This formation is a Principal Aquifer and is known for its high permeability and significant groundwater storage and flow potential. The underlying geology at Hardham is described as:

Sussex Rother Terrace Deposits, Facet 3a - Sand and Gravel overlying Gault Formation – Mudstone, that in turn, is underlain by the Folkestone Formation part of the Lower Greensand Group.

The geological sequence at Hardham is shown in Excerpt 1 and shows how Hythe Formation is discrete from the overlying Folkestone Formation and is therefore not in hydraulic continuity with the Arun Valley.

Excerpt 1 Schematic Geological Sequence at Hardham and On Site BGS1:50,000 Mapping



(Adapted from: British Geological Survey (BGS) | large image viewer | IIPMooViewer 2.0)

The Hythe Formation and Folkestone Formation aquifers are separated by the Sandgate Formation in this region which includes the Fittleworth Member and, due to the clay content, acts as an aquitard.

This means the Hythe Formation aquifer is confined by the overlying Fittleworth Member and is hydraulically separate from the overlying Folkestone Formation.

3.2 Hydrology

The proposed development is located in Arun Lower Operational Catchment and the Stor Water Body Catchment.

The Stor water body is located approximately 395m west of the site flowing to the north west where it meets with the River Arun at Winters Farm, east of the A29.

The Lower Arun operational catchment stretches from Littlehampton to Pulborough. It includes the tidal river Arun, a transitional waterbody, and its freshwater tributaries. The sub-catchment is mix of urban concentrations and open agricultural land. The biggest pressure on the environment in this area is water quality, with impacts from Sewage Treatment Works and diffuse pollution from urban and rural sources[3].

Groundwater in the Hythe Formation at the site is predominantly confined and, as a result, is unlikely to be providing flow to the River Stor. The borehole will not abstract groundwater from the river catchment area that serves the Arun Valley basin and therefore will not have any secondary impacts on water levels in the Arun Valley.

3.3 Statutory Environmental Designations

There are no statutory environmental designations located within 500m of the site.

The boundary of the South Downs National Park is 1.1km south east of the site and the Sullington Warren Site of Specific Scientific Interest (SSSI) is located approximately 560m west of the borehole.

The Sullington Warren SSSI lies on Sandgate Beds and Lower Greensand (Folkestone Formation). It supports a range of heathland habitats including both wet and dry heath, grassland, scrub and woodland. The woodland carries a rich community of breeding birds and was designated in 1985[4].

Groundwater is to be abstracted from the confined Hythe Formation at depth and therefore will not have any impact on water supply to the overlying SSSI.

These statutory designations are presented in Figure 3.

[3] https://environment.data.gov.uk/catchment-planning/OperationalCatchment/3266
[4] https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1001370.pdf

4 Baseline Water Consumption

This section outlines the existing baseline water consumption for the development site.

4.1 Existing Demand

There is a current baseline water consumption on site of c6m^3/day however, for conservatism and due to the proposed mitigation strategy, the existing demand and baseline water consumption has been taken as 0 Litres/Day.

Existing Baseline Consumption = 0 Litres/Day

4.2 Proposed Demand

The mains water demand will increase as a result of the proposed development through an increase in population on site.

4.2.1 Population

To assess the proposed occupancy of the site on completion, guidance from Horsham District Council's Frequently Asked Questions[5] has been used whereby the average occupancy rate for each type of dwelling has been derived from extrapolation of 2011 census data for Horsham District.

The average occupancy rates are as follows:

- One-bedroom dwellings: 1.32 occupants;
- Two-bedroom dwellings: 1.88 occupants;
- Three-bedroom dwellings: 2.47 occupants; and
- Four-bedroom dwellings: 2.86 occupants.

Table 2 Occupancy

Bedroom No'	*Occupancy*	*Number of Properties*	*Total*
1	1.32	6	7.92
2	1.88	35	65.8
3	2.47	55	135.85
4	2.86	12	34.32
		Total People	244

The total modelled occupancy on site = 244 People.

4.2.2 Part G Calculations

To model the proposed consumption the Part G Water Calculator[6] has been used. The efficiencies on site have been determined using the BREEAM New Construction 2018 Performance Level guidelines and these are presented in Annex B.

Two scenarios have been explored:

1. Performance Level 3 fixtures and fittings across the site and then; and

[5] https://www.horsham.gov.uk/planning/water-neutrality-in-horsham-district/water-neutrality-and-planning-applications
[6] The Code for Sustainable Homes, April 2009 and subsequent versions Building Regulations Approved Document Part G, 2009.

2. Assuming default standard efficiencies for washing machines and dishwashers across the site with Performance Level 3 efficiencies for all other fixtures.

The Part G Calculators presented in Annex C have derived a range of = 91.7 to 97.7 Litres/Person/Day, for conservatism, we have assumed 100 Litres/Person/Day.

Proposed Demand = 100 Litres/Person/Day = 24,400 Litres/Day (244*100) or 24.4m^3/Day.

5 Water Neutrality Mitigation Strategy

5.1 Mitigation Measures

The site qualifies for the Sussex North Water Certification Scheme (SNWCS), formerly SNOWS, within the Sussex North Water Resource Zone as the proposal aligns with emerging local and duly made neighbourhood planning policies[7].

Despite this, the mitigation strategy does not propose to use the SNWCS and has a two-fold on-site solution including:

1. Installing efficient fixtures and fittings capable of achieving Performance Level 3 of the BREAM New Construction 2018 guidelines; and
2. Providing potable water to the site using an on-site licensed groundwater abstraction.

Examples of fixtures and fittings widely available that can achieve Performance Level 3 or better are presented in Annex D and details of the borehole works, carried out by Hydrock Ltd[8], are presented in Annex E and summarised in Section 6.

In the event the borehole solution is not progressed at Reserved Matters stage, an alternative scheme, the Sussex North Water Certification Scheme (SNWCS), will be used to achieve water neutrality on site. As an allocated site, the site is deemed eligible for SNWCS credits and it is requested that access to the scheme is granted in principle now, with confirmation to be provided at Reserved Matters stage if the credits are to be required.

5.2 Guidance on the Use of Boreholes for Water Neutrality

In line with Horsham District Council's guidance on using boreholes to achieve water neutrality[9], the following tasks have been undertaken and are reported in the following section:

- Assessment of hydrogeological connectivity between the proposed site and the Arun Valley basin to confirm that the abstraction of water will not take water from the Arun Valley habitat sites, or otherwise impact on their integrity;
- Assessment of nearby Statutory and Non-Statutory Environmental Designations and identification of potential risks from the abstraction;
- Inclusion of testing data into the report including water quality results and water treatment requirements provided by a third party;
- Provision of the sampling and testing regime in accordance with Private Water Supplies (England) Regulations 2016 (as amended);
- A maintenance, monitoring and management plan;
- A list of all properties, including their land uses and activities, that fall within 50m of the borehole(s) which could have the potential to cause pollution, a list of all the activities that would need to be restricted within the zone and how occupiers will be notified of these restrictions in the event permission is granted. Annotation of affected properties on a map of the local area alongside the location of the new boreholes and the extent of the Source Protection Zone (SPZ).

[7] https://www.horsham.gov.uk/__data/assets/pdf_file/0003/65298/Thakeham-Neighbourhood-Plan.pdf
[8] Rock Road, Storrington Water Supply Borehole Investigation for Thakeham Tiles Ltd, 08347-HYD-XX-XX-RP-GE-1005, 11 December 2024
[9] Water neutrality and planning applications | Horsham District Council

5.3 Abstraction Licensing

On behalf of the applicant, H2Ogeo applied for a groundwater abstraction licence with the Environment Agency on the 7 March 2025.

The abstraction licence is for:

- 19,038m^3/year;
- 52.5m^3/day; and
- 2.175m^3/hour.

The application was validated and accepted by the Environment Agency on the 2 April 2025 (NPS/WR/043620). The abstraction licence (SO/041/00255/023) was determined on the 7 October 2025 and issued.

A copy of the correspondence and the licence itself is presented in Annex F.

6 Summary of Hydrock Ltd's Work

The following section is a summary of the work carried out by Hydrock Ltd and their report is presented in Annex E.

6.1 Geology

The site is situated within the Cretaceous Lower Greensand Group. This group includes four main geological formations: the Atherfield Clay, Hythe Formation, Sandgate Beds (Fittleworth Member), and the Folkestone Formation. The Hythe and Folkestone Formations are both designated Principal aquifers but are hydraulically separated by the Fittleworth Member, which acts as an aquitard.

6.2 Ground Investigation Consent and Works

Hydrock obtained Ground Investigation Consent from the Environment Agency to drill a borehole into the Hythe Formation, the consent is presented in Annex E. The investigation included soil and groundwater sampling, as well as pumping tests to assess the feasibility of sustainable groundwater abstraction for the proposed residential development.

A single borehole was drilled to a depth of approximately 58 metres below ground level (bgl) using rotary open-hole techniques by Marshall Drilling Ltd. Project Dewatering Ltd completed the aquifer testing, while Hydrock supervised the work and collected soil and groundwater samples for laboratory analysis.

6.3 Geological Results

The borehole encountered surface concrete hardstanding, made ground, the Fittleworth Member, and then the Hythe Formation starting at around 27 metres bgl.

The well liner was installed in the borehole to a depth of 56.07mbgl due to a collapse on encountering a fracture. A 250mm diameter steel outer casing was permanently installed from ground level to 5mbgl with a 126mm internal diameter (ID) UPVC plastic pipe installed inside the steel casing from ground level to the base. Slotted pipe was installed from 31.63 to 55.07mbgl and a plain casing sump installed in the bottom metre of the borehole.

Groundwater was initially struck at 19.8mbgl on 11 September 2024 and rose to 12.25mbgl within 40 minutes.

Step and constant rate pumping tests were conducted on the borehole with steps ranging from 48m^3/day to 144m^3/day. Drawdowns in the well ranged from 0.01m to 0.035 with recharge occurring within 20 minutes of test cessation.

The 24 hour constant rate pumping test was carried out at 84m^3/day and showed no drawdown, potentially as a consequence of rainfall during testing.

6.4 Water Quality Results

Three groundwater samples taken during the constant rate test were analysed under the Private Water Supplies (England) Regulations 2016.

Inorganic and organic chemical concentrations were within acceptable limits or below detection thresholds. However, coliform bacteria were detected above safe levels in all samples, and enterococci were found in the initial sample, indicating the need for disinfection.

Water quality results are presented in Annex E, Section 6.2, Page 28.

6.5 Treatment Recommendations

Standard disinfection methods, such as chlorination or UV filtration, will be required to make the water suitable for consumption, along with turbidity reduction via filtration. Further sampling and testing of the treated water supply will be necessary to confirm the effectiveness of the treatment prior to any public or private use.

6.6 Aquifer Capacity and Water Balance

A water balance assessment showed that annual recharge to the Hythe Formation significantly exceeds the anticipated abstraction rate. This, along with the aquifer's high permeability and favourable local hydrogeological conditions, suggests the borehole can supply the required water without negatively impacting regional water resources.

7 Operational Plans

The following section outlines the monitoring and maintenance plan for the borehole solution.

7.1 Monitoring Plan

7.1.1 Objectives

The monitoring and sampling plan ensures the safety of the drinking water, compliance with regulatory standards and early detection of contaminants or pollution.

7.1.2 Monitoring Points

The plan will identify key points within the water supply system where monitoring and sampling will take place. This could include intake points, treatment facilities, distribution network points, and consumer taps.

7.1.3 Frequency of Sampling and Parameter Analysis

This will be driven by the Local Authority and the Water Supply Regulations 2016 risk assessment. It is likely that in the first two years of operation sampling and analysis will need to take place twice a year or, following a pollution incident.

The suite of analysis for drinking water and private supplies will be determined by the risk assessment and this should be communicated to the operator by the Local Authority. This will include physical, chemical and microbiological parameters such as pH, turbidity, chlorine levels, heavy metals and bacteria as per the Water Supply Regulations 2016.

Ongoing sampling and analysis should be based on trends observed during the first phase of monitoring.

7.1.4 Sampling and Analysis Methodology

Sampling will be carried out by a competent person and analysis carried out at a UKAS accredited Laboratory in line with the Water Supply Regulations 2016.

Implementing Quality Assurance (QA) and Quality Control (QC) measures to ensure the reliability and accuracy of monitoring data is essential. This will include calibration of equipment, duplicate sampling and blind samples.

7.1.5 Documentation and Record-Keeping

Detailed records of all monitoring and sampling activities, including dates, times, locations, parameters, results and any corrective actions will be kept by the operator and provided to the Local Authority on required.

The documentation will be readily accessible for audits and regulatory inspections.

7.1.6 Review and Revisions

The monitoring plan must undergo regular annual review to assess its effectiveness and identify areas for improvement. The plan should be updated as required to reflect any changes in regulations, technology or operational conditions.

7.2 Borehole Management & Maintenance Plan

7.2.1 Registration With the Local Authority

The borehole must be registered with the Local Authority to enable them to carry out a risk assessment and monitoring under the private water regulations, if required. The Local Authority will advise the appropriate agencies to ensure there is no risk to the supply's catchment area.

The Local Authority will also be able to assist by informing the operator of potential contamination threats to aquifers that may serve the and notify of any updates in legislation involving private water supplies and responsibilities of the operator.

The borehole management and maintenance plan involves the following key steps to ensure the safety, efficiency and regulatory compliance.

Details of the borehole including depths, construction, pump details will be provided to the Local Authority with information held on site by the Operator.

7.2.2 Risk Assessment

The Local Authority will undertake a risk assessment to identify potential hazards associated with the borehole such as contamination, structural integrity and health and safety concerns. The maintenance schedule will then be designed around this assessment.

7.2.3 Maintenance Plan

The maintenance plan will schedule routine maintenance tasks such as cleaning, disinfection, lubrication and inspection of borehole components.

It will also identify potential maintenance issues and develop protocols for addressing them promptly, such as repairing leaks, replacing worn parts, and addressing corrosion or fouling.

Water Treatment Works

- Turbidity Unit, once fitted, will require little or no maintenance; and
- UV Steriliser will require two bulbs replacing each year.

Annual works will include:

- Cleaning of chlorinated storage tanks; and
- Legionella sampling and analysis.

7.2.4 Emergency Response Plan

An emergency response plan will be developed outlining procedures for responding to emergencies such as contamination incidents, equipment failures, or breaches of borehole integrity.

The plan will identify emergency contacts, resources, and procedures for notifying relevant authorities and stakeholders in the event of an emergency.

8 Preliminary Risk Assessment of Surrounding Area

The following section provides a summary of the surrounding properties, including land uses and activities, that fall within 50m of the borehole.

Figure 4 presents a 50m buffer zone around the borehole and shows nearby properties, in addition the following has been noted:

- There are currently no residential properties within 50m of the borehole;
- The existing buildings on site that are within 50m of the borehole will be demolished and replaced with new residential properties;
- Rock Road runs east-west along the northern boundary of the site and within 50m of the borehole;
- There are no Contaminated Land Designated sites within the 50m buffer.

It is recommended that future occupiers are made aware of the potential pollution risks associated with the site and borehole solution.

8.1 Source Protection Zone

For the purpose of groundwater protection a source protection zone of 50m has been assumed around the borehole, as presented in Figure 4.

It is recommended that the Environment Agency's position statements[10] on activities within a source protection zone are adhered to.

The position statements that apply to developments and activities in SPZ1 include those on:

- Infrastructure;
- Storage of pollutants;
- Landfill;
- Non-landfill waste activities;
- Discharge of liquid effluent into the ground;
- Diffuse sources;
- Cemetery developments;
- Burial of animal carcasses;
- Managing groundwater resources; and
- Ground source heating and cooling.

These position statements can be found at:

https://assets.publishing.service.gov.uk/media/5ab38864e5274a3dc898e29b/Envirnment-Agency-approach-to-groundwater-protection.pdf

[10] Environment-Agency-approach-to-groundwater-protection.pdf (publishing.service.gov.uk)

9 Results & Discussion

The geological formation being abstracted from on site is the Hythe Formation. The Hythe Formation is beneath the confining layer of the Sandgate Formation and overlying this layer is the Folkestone Formation that is pumped at the Hardham source.

As a result there is no hydrogeological continuity between the site and the Hardham abstraction or Arun Valley.

The proposed scheme will not have any impact on any nearby Statutory Environmental Designations and, due to the confined nature of the Hythe Formation being abstracted from, will not have any impact on the designated sites in the Arun Valley through ground and/or surface water.

Constant rate testing has demonstrated that the licensed abstraction rate of 52.5m^3/day is achievable with little drawdown and analysis of the water quality and preliminary treatment design has indicated water treatment to the standards outlined in the Water Supply Regulations 2016 is achievable.

Based on the findings of the field works and this Water Neutrality Statement, the proposed development will not contribute to an existing adverse effect upon the integrity of the internationally designated Arun Valley Special Area of Conservation, Special Protection Area and Ramsar sites by way of increased water abstraction.

9.1 Potable Water Feasibility Review

A Potable Water Feasibility Report has been undertaken by Stantec UK Ltd (formerly Hydrock Ltd) and is presented in Annex E, it evaluates how the proposed residential redevelopment can meet its potable water needs.

The assessment estimates water demand based on the number of dwellings, their occupancy, and typical water use per fixture using BS EN 806 and Chartered Institute of Plumbing and Heating Engineering (CIPHE) guidance.

The peak simultaneous water flow required for the site is calculated to be 7.05 litres per second, while the borehole licence can only provide a steady 0.6 litres per second. This mismatch necessitates a storage solution to supply water during periods of peak demand.

Daily water demand across the site is calculated at 32,100 litres. Following CIPHE guidelines, the report recommends storing 50% of this amount to ensure reliability during high-demand periods, resulting in a required storage volume of 16,050 litres. The proposed solution includes a dual-compartment tank with an actual capacity of 18,000 litres, supported by a structural base and connected to a boosting system. An hourly water usage profile was also created to verify the sufficiency of the storage system.

An indicative layout for a tank room and water distribution system is presented in Annex E, considering the potential location, space requirements and practical issues like proximity to the borehole. The storage system is designed to allow continuous borehole operation at its limited rate while buffering the peak usage times in the homes.

The report concludes that it is feasible to meet potable water needs for the development using the proposed borehole and storage solution.

10 Conclusion

The proposed development, with a borehole abstraction strategy will achieve water neutrality.

The proposed development will not rely at all on mains water from the Sussex North water supply zone. Rates of abstraction achieved in the borehole, with minimal drawdown, indicates the borehole can sustainably provide the licensed amounts required for, up to 52.5m^3/Day.

Only 24.4m^3/Day demand is anticipated for the proposed development.

Table 3 Water Neutrality Summary

Baseline Consumption (L/Day)	***Proposed Consumption (L/Day)***	***Mitigation – Licensed Groundwater Abstraction (L/Day)***	***Water Neutral***
0	24,400	52,500	**YES**

In the event the borehole solution is not progressed at Reserved Matters stage, an alternative scheme, the Sussex North Water Certification Scheme (SNWCS), will be used to achieve water neutrality on site. As an allocated site, the site is deemed eligible for SNWCS credits and it is requested that access to the scheme is granted in principle now, with confirmation to be provided at Reserved Matters stage if the credits are to be required.

This Water Neutrality Statement demonstrates that the proposed development will not contribute to an existing adverse effect upon the integrity of the internationally designated Arun Valley Special Area of Conservation, Special Protection Area and Ramsar sites by way of increased water abstraction.

11 Figures

Figure 1 Site Location

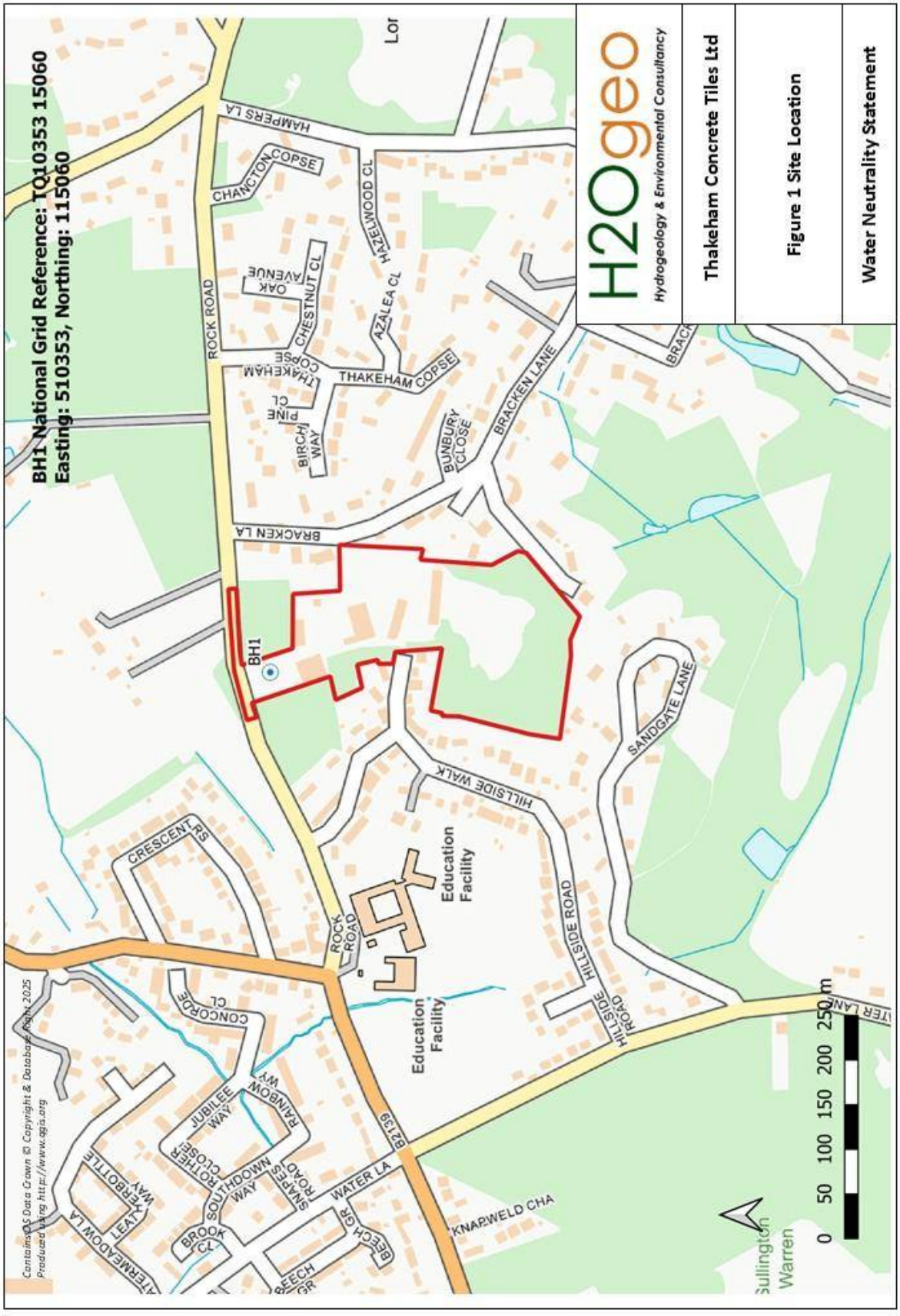


Figure 2 Sussex North WRZ

Figure 3 Statutory Designations

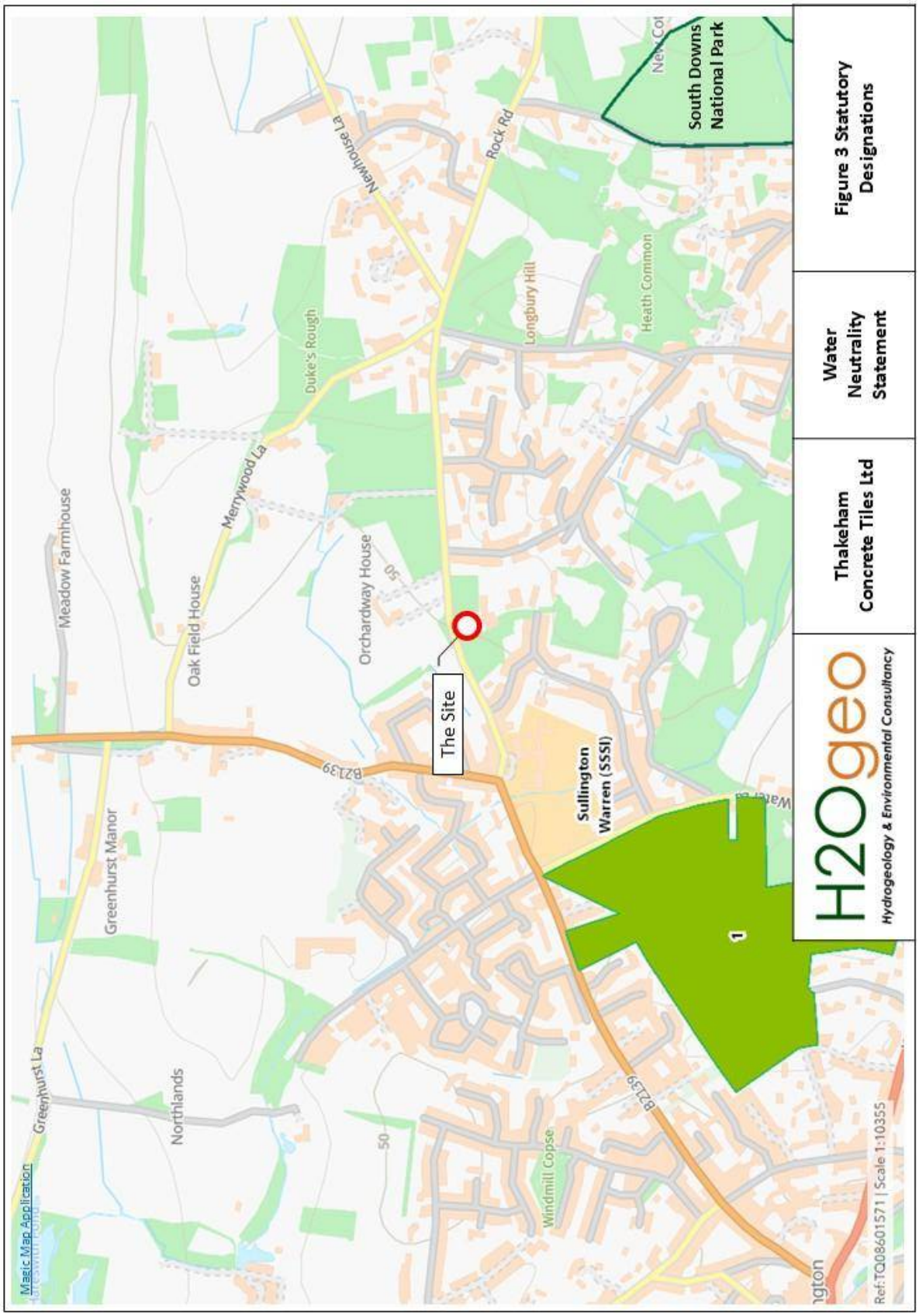
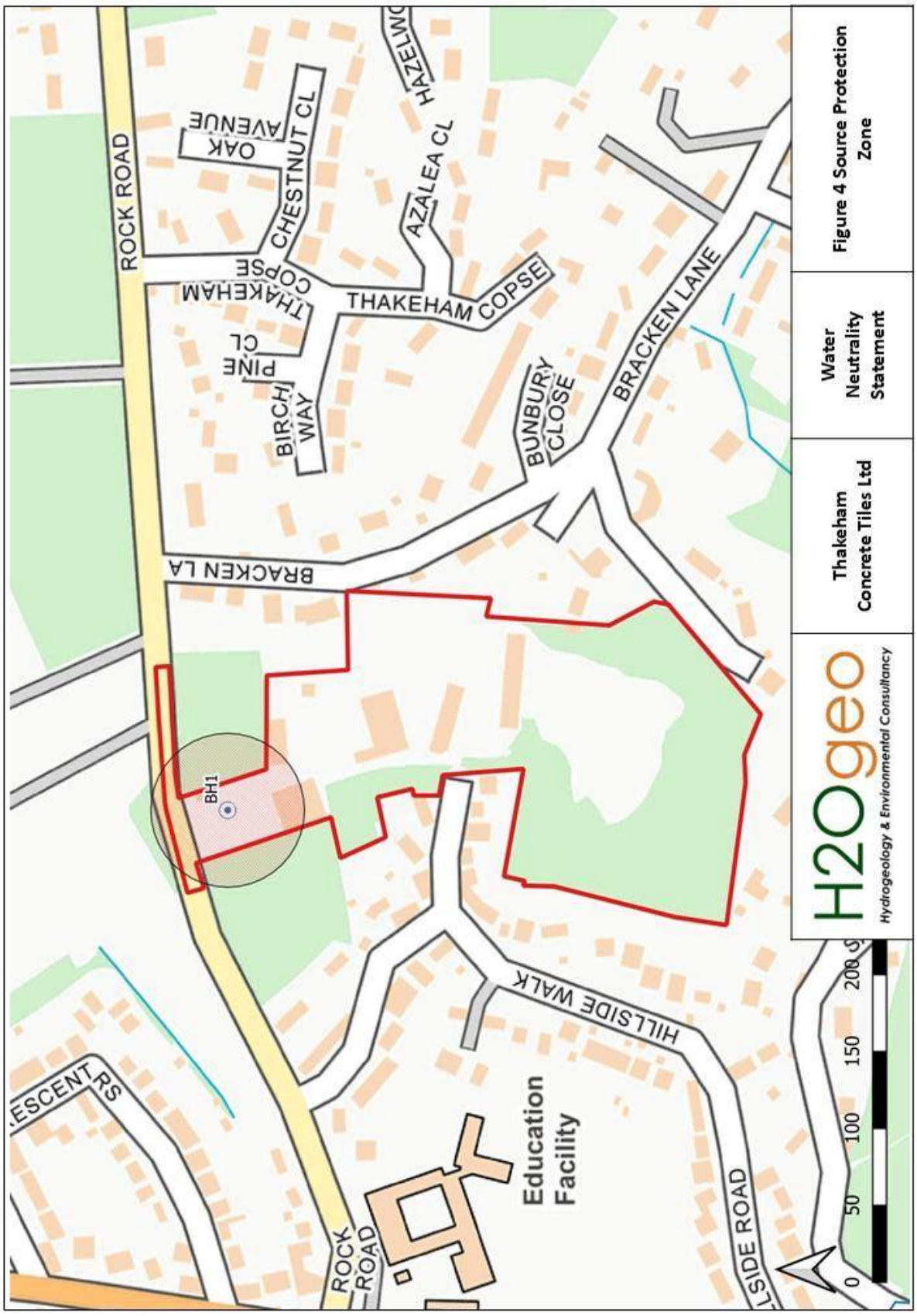


Figure 4 Source Protection Zone



12 Annexes

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Annex C - Part G Water Calculator

Annex D – Example Performance Level 3 Fixtures and Fittings

Annex E – Hydrock Ltd Report and Groundwater Investigation Consent

Annex F – Environment Agency Correspondence

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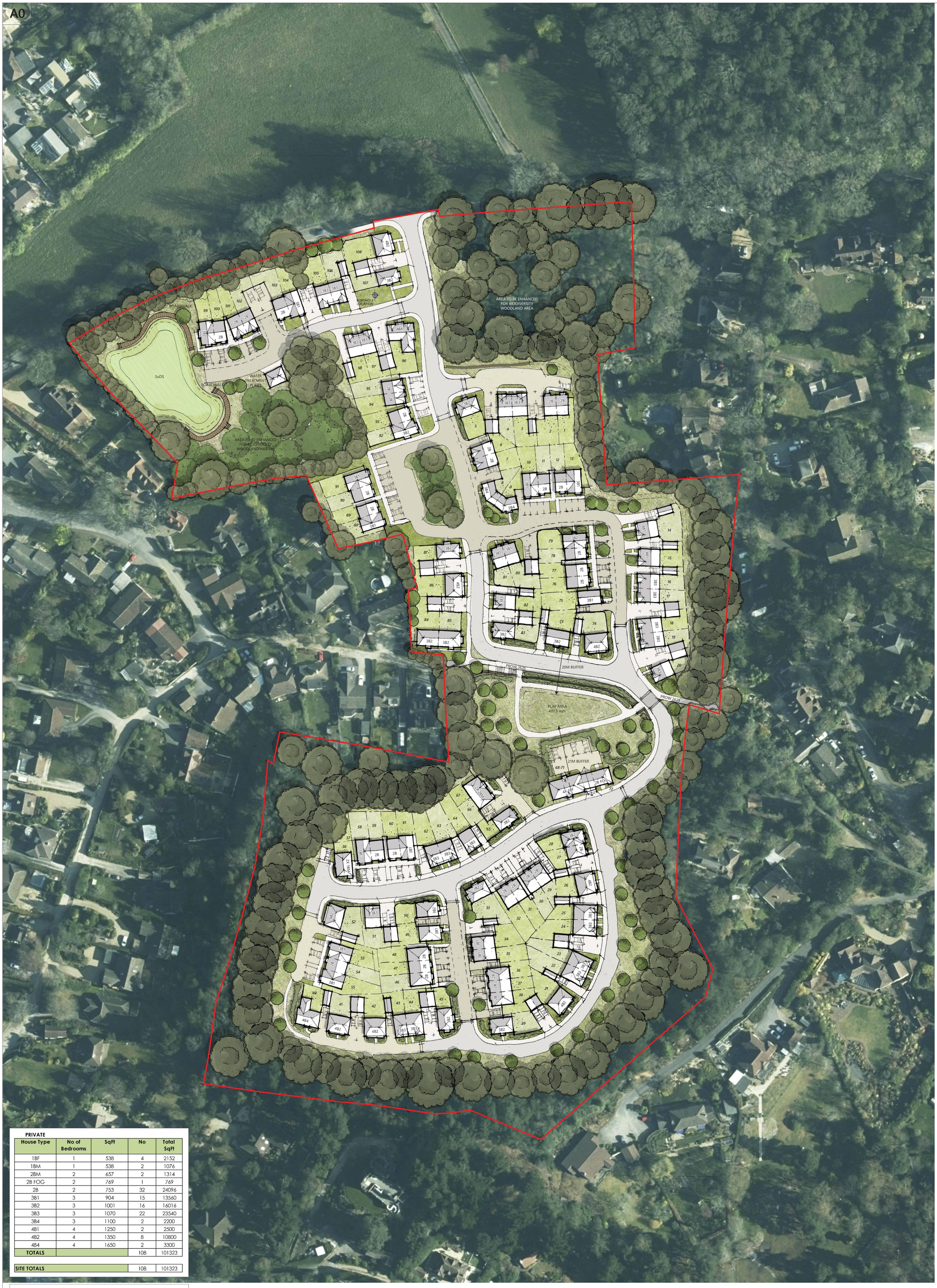

PRIVATE

House Type	No of Bedrooms	SqFt	No	Total SqFt
1BF	1	538	4	2152
1BM	1	538	2	1076
2BM	2	657	2	1314
2B FOG	2	769	1	769
2B	2	753	32	24096
3B1	3	904	15	13560
3B2	3	1001	16	16016
3B3	3	1070	22	23540
3B4	3	1100	2	2200
4B1	4	1250	2	2500
4B2	4	1350	8	10800
4B4	4	1650	2	3300
TOTALS			108	101323

SITE TOTALS	108	101323

— Site Boundary
26 Plot Number
3B2 House Type

0 5 10 15 20 25 30 35 40 45 50m
1:500

N

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Portishead T: 01275 407000
London T: 01794 367703

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Rev	Description	Date	Au	Ch
A	Issued for Planning	10.09.25	CI/HP	--/--

Project	**Land at Thakeham Tiles, Storrington**
Drawing	**Illustrative Masterplan - 04**
	-
Client	**Thakeham Tiles Ltd**
Job no.	**THAK230417**
Dwg no.	**IMP-04**
Date	**10.09.25**
Rev.	**A**
Author	**CI/HP**
Checked	**-/-**
Scale	**1:500@A0**
Status	**PLANNING**
Office	**Romsey**
Client ref.	-

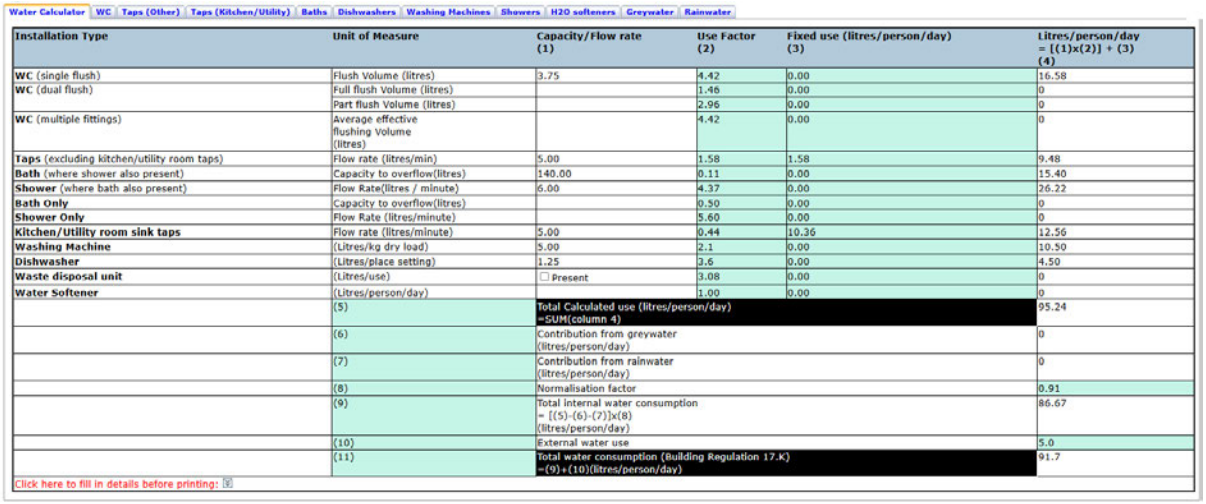
thrive. architects

Annex B - BREEAM Guidelines

Component	Performance levels (quoted numbers are minimum performance required to achieve the level)						
	Base	1	2	3	4	5	Unit
WC	6	4.5	4	3.75	3.5	3	Effective flush volume (litres) (see Definitions on page 216)
Wash-hand basin taps	10	8	6	5	4	3	litres/min
Showers	12	10	8	6	5	3.50	litres/min
Baths	200	180	160	140	120	100	litres
Urinal (2 or more urinals)	7.50	6	3	1.50	0.75	0	litres/bowl/ hour
Urinal (1 urinal only)	10	8	4	2	1	0	litres/bowl/ hour
Greywater and rainwater system	0%	0%	0%	25%	50%	75%	% of WC or urinal flushing demand met using recycled non-potable water
Kitchen tap: kitchenette	10	8	7	6	5	5	litres/min
Kitchen taps: restaurant (pre-rinse nozzles only)	10.30	9	8.30	7.30	6.30	6	litres/min
Domestic sized dishwashers	17	13	13	12	11	10	litres/cycle
Domestic sized washing machines	90	60	50	40	35	30	litres/use
Waste disposal unit	17	17	0	0	0	0	litres/min
Commercial sized dishwashers	8	7	6	5	4	3	litres/rack
Commercial or industrial sized washing machines	14	12	10	7.50	5	4.50	litres/kg

Annex C - Part G Water Calculator

Part G Calculation with Performance Level 3 (PL3) Fixtures and Fittings

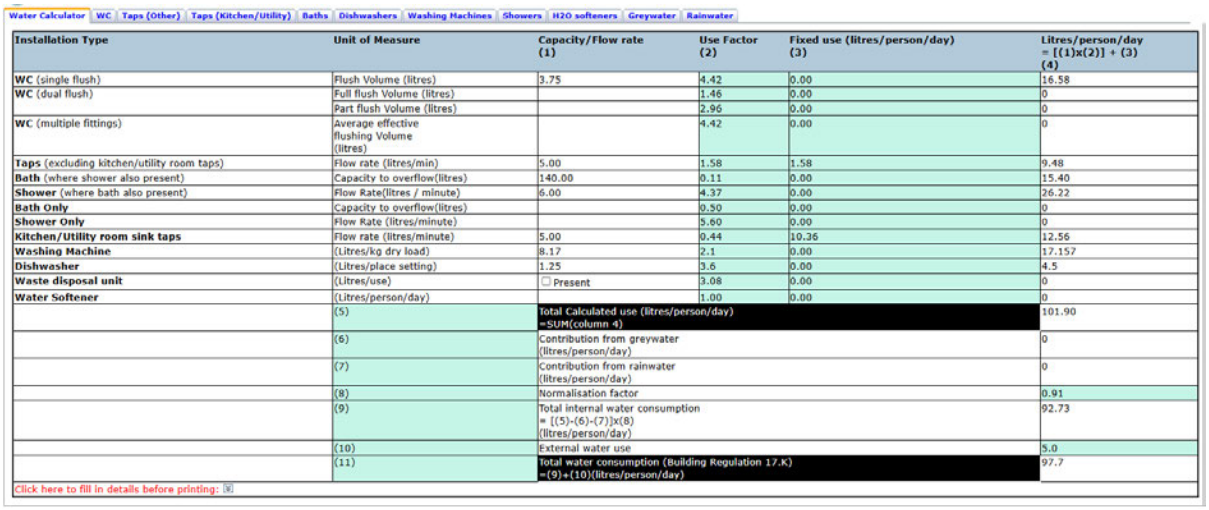


Water Calculator | WC | Taps (Other) | Taps (Kitchen/Utility) | Baths | Dishwashers | Washing Machines | Showers | H2O softeners | Greywater | Rainwater

Installation Type	Unit of Measure	Capacity/Flow rate (1)	Use Factor (2)	Fixed use (litres/person/day) (3)	Litres/person/day = [(1)x(2)] + (3) (4)
WC (single flush)	Flush Volume (litres)	3.75	4.42	0.00	16.58
WC (dual flush)	Full flush Volume (litres)		1.46	0.00	0
	Part flush Volume (litres)		2.96	0.00	0
WC (multiple fittings)	Average effective flushing Volume (litres)		4.42	0.00	0
Taps (excluding kitchen/utility room taps)	Flow rate (litres/min)	5.00	1.58	1.58	9.48
Bath (where shower also present)	Capacity to overflow(litres)	140.00	0.11	0.00	15.40
Shower (where bath also present)	Flow Rate(litres / minute)	6.00	4.37	0.00	26.22
Bath Only	Capacity to overflow(litres)		0.50	0.00	0
Shower Only	Flow Rate (litres/minute)		5.60	0.00	0
Kitchen/Utility room sink taps	Flow rate (litres/minute)	5.00	0.44	10.36	12.56
Washing Machine	(Litres/kg dry load)	5.00	2.1	0.00	10.50
Dishwasher	(Litres/place setting)	1.25	3.6	0.00	4.50
Waste disposal unit	(Litres/use)	☐ Present	3.08	0.00	0
Water Softener	(Litres/person/day)		1.00	0.00	0
	(5)	**Total Calculated use (litres/person/day) =SUM(column 4)**			95.24
	(6)	Contribution from greywater (litres/person/day)			0
	(7)	Contribution from rainwater (litres/person/day)			0
	(8)	Normalisation factor			0.91
	(9)	Total internal water consumption = [(5)-(6)-(7)]x(8) (litres/person/day)			86.67
	(10)	External water use			5.0
	(11)	**Total water consumption (Building Regulation 17.K) =(9)+(10)(litres/person/day)**			91.7

Click here to fill in details before printing:

Part G Calculation with PL3 Fixtures and Fittings and Default Washing Machine & Dishwasher



Water Calculator | WC | Taps (Other) | Taps (Kitchen/Utility) | Baths | Dishwashers | Washing Machines | Showers | H2O softeners | Greywater | Rainwater

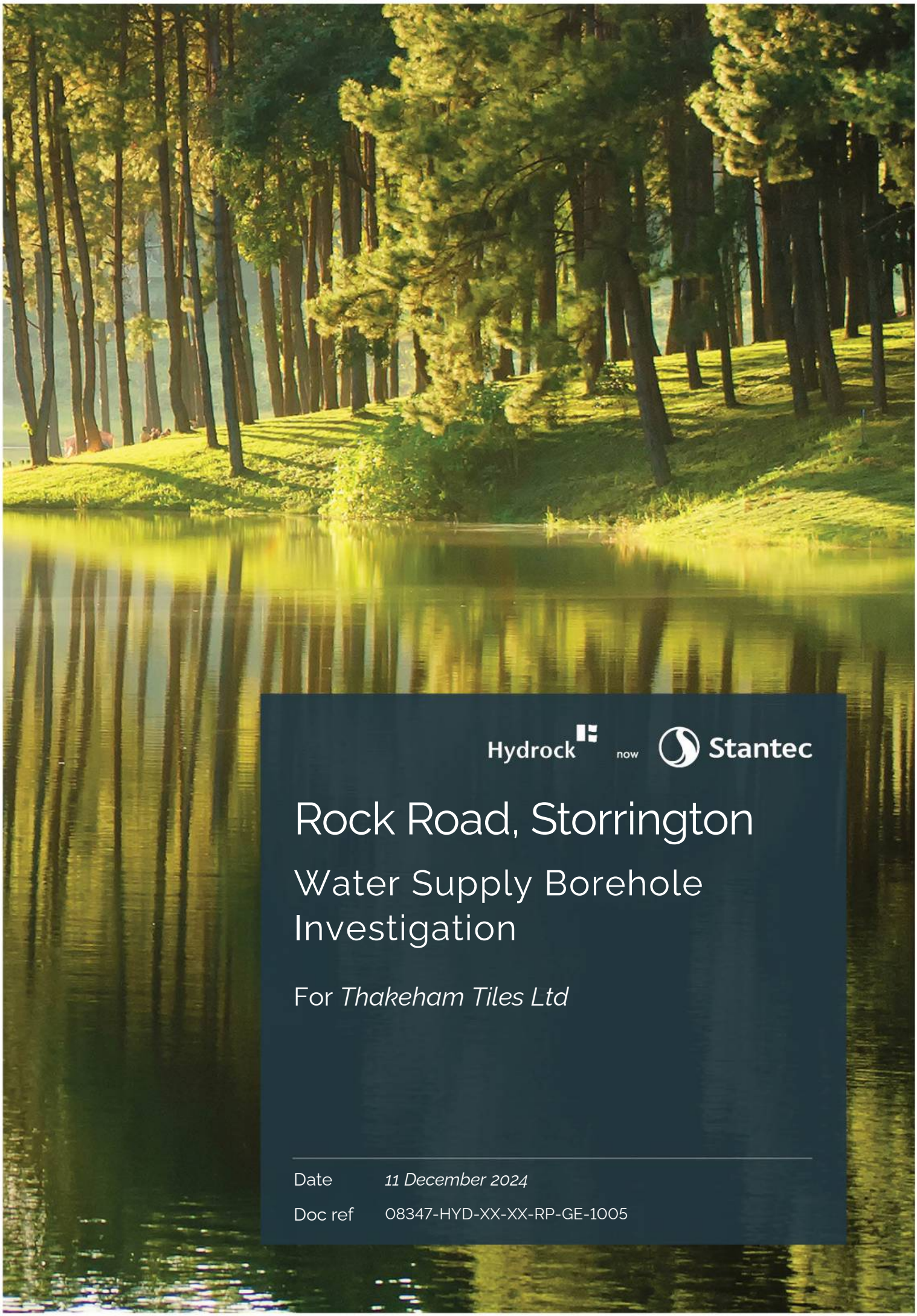
Installation Type	Unit of Measure	Capacity/Flow rate (1)	Use Factor (2)	Fixed use (litres/person/day) (3)	Litres/person/day = [(1)x(2)] + (3) (4)
WC (single flush)	Flush Volume (litres)	3.75	4.42	0.00	16.58
WC (dual flush)	Full flush Volume (litres)		1.46	0.00	0
	Part flush Volume (litres)		2.96	0.00	0
WC (multiple fittings)	Average effective flushing Volume (litres)		4.42	0.00	0
Taps (excluding kitchen/utility room taps)	Flow rate (litres/min)	5.00	1.58	1.58	9.48
Bath (where shower also present)	Capacity to overflow(litres)	140.00	0.11	0.00	15.40
Shower (where bath also present)	Flow Rate(litres / minute)	6.00	4.37	0.00	26.22
Bath Only	Capacity to overflow(litres)		0.50	0.00	0
Shower Only	Flow Rate (litres/minute)		5.60	0.00	0
Kitchen/Utility room sink taps	Flow rate (litres/minute)	5.00	0.44	10.36	12.56
Washing Machine	(Litres/kg dry load)	8.17	2.1	0.00	17.157
Dishwasher	(Litres/place setting)	1.25	3.6	0.00	4.5
Waste disposal unit	(Litres/use)	☐ Present	3.08	0.00	0
Water Softener	(Litres/person/day)		1.00	0.00	0
	(5)	**Total Calculated use (litres/person/day) =SUM(column 4)**			101.90
	(6)	Contribution from greywater (litres/person/day)			0
	(7)	Contribution from rainwater (litres/person/day)			0
	(8)	Normalisation factor			0.91
	(9)	Total internal water consumption = [(5)-(6)-(7)]x(8) (litres/person/day)			92.73
	(10)	External water use			5.0
	(11)	**Total water consumption (Building Regulation 17.K) =(9)+(10)(litres/person/day)**			97.7

Click here to fill in details before printing:

Annex D – Example Performance Level 3 Fixtures and Fittings

Type	*Brand/Make/Model*	*Flow Rate*	*Unit*	*Performance Level*
Wash-hand Basin Tap	Grohe Eurosmart Cosmopolitan Basin Mixer Tap	3.5	Litres/Minute	4
	Hansgrohe Talis S EcoSmart Basin Mixer Tap	3.5	Litres/Minute	4
	Bristan Prism Eco Basin Mixer Tap	3.8	Litres/Minute	3
	Ideal Standard Tesi Basin Mixer Tap with EcoFlow Regulator	3.7	Litres/Minute	3
	Methven Minimalist Basin Mixer Tap with Satinjet Technology	3.5	Litres/Minute	4
Showers	Mira Eco 4 Spray Showerhead	4	Litres/Minute	4
	Hansgrohe Croma 100 Vario EcoSmart Showerhead	3.5	Litres/Minute	4
	Methven Waipori Satinjet Ultra Low Flow Showerhead	4.5	Litres/Minute	4
	Triton Dene Low Flow Fixed Showerhead	4	Litres/Minute	4
	Aqualisa EcoSpray 105 Showerhead	3.8	Litres/Minute	4
Baths	Armitage Shanks Sandringham 21 Compact Bath	110	Litres Overflow	4
	Twyford Celtic Compact Bath	100	Litres Overflow	4
	Kalderwei Saniform Plus Small Steel Bath	105	Litres Overflow	4
	Carron Compact Acrylic Bath	115	Litres Overflow	4
	Ideal Standard Tempo Space Saving Bath	110	Litres Overflow	4
WC	Roca The Gap Wall-Hung Toilet with 3/4.5L Dual Flush	3.38	Effective Flush Litres	4
	Ideal Standard Concept Air Back-to-Wall Toilet with Dual Flush	3.38	Effective Flush Litres	4
	VitrA S50 Compact Wall-Hung WC with Dual Flush	3.38	Effective Flush Litres	4
	Twyford E100 Square Close-Coupled WC with 3/4.5L Dual Flush	3.38	Effective Flush Litres	4
	Grohe Bau Ceramic Wall-Hung WC with 3/4.5L Dual Flush	3.38	Effective Flush Litres	4
Kitchen Taps	Grohe BauEdge Single-Lever Kitchen Mixer Tap	4.5	Litres/Minute	4
	Hansgrohe Metris Select Kitchen Mixer Tap	4	Litres/Minute	4
	Franke Eiger Eco Kitchen Mixer Tap	4	Litres/Minute	4
	Blanco Fontas II Filter Kitchen Mixer Tap	4.5	Litres/Minute	4
	Bristan Orta Eco Kitchen Mixer Tap	4.8	Litres/Minute	4
Washing Machines	Samsung Series 6 WW80T684DLN/S1 Washing Machine	4.9	Litres/dry kg load	3
	Bosch Serie 8 WAW325H0GB Washing Machine	4.8	Litres/dry kg load	3
	LG F4V909WTSE Washing Machine	4.5	Litres/dry kg load	3
	AEG L7FEE865R 8000 Series Washing Machine	4.8	Litres/dry kg load	3
	Miele WED125 WCS Washing Machine	4.6	Litres/dry kg load	3
Dishwashers	Bosch Serie 6 SMS6ZDW48G Freestanding Dishwasher	0.74	Litres/Place Setting	4
	Miele G5260 SCVi Integrated Dishwasher	0.73	Litres/Place Setting	4
	Siemens iQ500 SN258I06TG Freestanding Dishwasher	0.75	Litres/Place Setting	4
	Neff N50 S513K60X1G Integrated Dishwasher	0.75	Litres/Place Setting	4
	AEG FFE62620PM Freestanding Dishwasher	0.76	Litres/Place Setting	4

Annex E – Hydrock Ltd Report, Groundwater Investigation Consent & Stantec UK Ltd (Formerly Hydrock Ltd) Feasibility Review



Hydrock now Stantec

Rock Road, Storrington

Water Supply Borehole Investigation

For *Thakeham Tiles Ltd*

Date	*11 December 2024*
Doc ref	08347-HYD-XX-XX-RP-GE-1005

Document control sheet

Issued by	Hydrock Consultants Limited White Building 1-4 Cumberland Place Southampton Hampshire SO15 2NP United Kingdom	T +44 (0)23 82140907 E southampton@hydrock.com hydrock.com
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Project number	08347	
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Document production record		
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Document revision record			
Issue number	Status	Date	Revision details
P01	S2	08/11/2024	Draft issue for client review
P02	S2	11/12/2024	Final issue

Contents

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Figures

Appendices

Executive Summary

Thakeham Tiles Ltd are proposing to re-develop their site on Rock Road, Storrington, Pulborough for a residential development. The site is located within the Hardham Basin of the Arun and Western Streams abstraction licensing area and the Sussex North Water Resource Zone. There is concern that large groundwater abstractions from the Folkstone Formation within the Hardham Basin exceed the sustainable limit for the aquifer. This is potentially impacting on the designated wildlife sites within the Arun Valley (SAC, SPA, SSSIs and Ramsar site) and resulted in a Position Statement by Natural England for all new developments to achieve water neutrality to help reduce pressure on the Folkstone Formation aquifer.

Hydrock Consultants Ltd (Hydrock, now Stantec - referred to hereafter as Hydrock), have been commissioned by Thakeham Tiles to investigate the feasibility for a groundwater abstraction from the Hythe Formation for use as a private drinking water supply for the site with a proposed flow rate not exceeding 84m^3/d.

The site is within Storrington which is situated within the South Downs of West Sussex and is part of the Wealden District. The geology comprises the Northern belt of the Cretaceous Lower Greensand Group which is separated into four formations: the Atherfield Clay, the Hythe Formation, the Sandgate Beds (Fittleworth Member) and the Folkestone Formation. The Hythe Formation and Folkestone Formation are Principal aquifers which are hydraulically separated by the Fittleworth Member aquitard.

A Ground Investigation Consent was issued by the Environment Agency (EA) to Hydrock on behalf of the client in order to carry out the investigation works. This comprised of drilling one borehole into the Hythe Formation, obtain soil and groundwater samples and undertake pumping tests to record the capabilities of abstracting groundwater from the well.

Thakeham Tiles commissioned the drilling and testing of a single borehole to 58m bgl within the Hythe Formation Principal aquifer. The borehole was drilled and developed by Marshall Drilling Ltd by rotary open hole technique and aquifer testing was completed by Project Dewatering Ltd. Hydrock supervised both activities and collected samples of soils and groundwater for laboratory analysis.

The ground conditions encountered within BH1, were broadly consistent with previous investigations at the site and comprised of the following:

- Surface covering (concrete hardstanding) from 0 to 0.3 metres below ground level (m bgl);
- Made Ground from 0.3m to 0.5m bgl;
- Fittleworth Member from 0.5m to approximately 27m bgl; and
- Hythe Formation from 27m to 58m bgl (not fully proven).

A 126mm internal diameter well liner was installed to 56.07m bgl.

An initial groundwater strike was encountered during drilling at 19.8m bgl on the 11th September and after 40 minutes this rose to 12.25m bgl. Manual groundwater dips taken from 11th September to the 25th September recorded groundwater levels between 13.65m to 14.4m bgl.

Step testing between 48 and 144m^3/day and constant rate testing at a flow rate of 84m^3/day was undertaken for a period of 24 hours with follow-up recovery monitoring. Both testing resulted in limited drawdown in groundwater level and is likely to be caused by a combination of the high permeability of the Hythe Formation and fracture encountered at 45.5m depth; the relatively low abstraction rate

required and therefore tested, and rainfall occurring in the days leading up to the testing causing groundwater levels to rise.

A water balance assessment has concluded that the estimated annual recharge of the Hythe Formation aquifer is significantly greater than the proposed annual abstraction rate. Consequently, due to the high permeability of the aquifer and the water availability of the Hythe Formation within the catchment at the site, it is considered that the borehole is likely to produce the required yields for the proposed development without having an adverse effect on the water availability within the catchment.

Water quality testing was undertaken in line with the Private Water Supplies (England) Regulations 2016 on three samples of untreated groundwater collected at the start, middle and end of the constant rate testing. All inorganic and organic chemical parameters were below the maximum concentration/value and/or below the limit of detection. Enterococci was detected in the first sample collected and coliform bacteria were present above the maximum value in all samples, however the number of counts reduced with time. The presence of coliforms and enterococci in the untreated groundwater means that disinfection (such as by chlorination or UV filtration) will be required as part of the water treatment for the water supply, which is standard practice. Filtration is likely to be required to reduce turbidity below the Private Water Supplies (England) Regulations 2016 threshold. Further sampling analysis of the water supply prior to consumption will be required to confirm the treatment is working.

1. Introduction

1.1 Terms of reference

In August 2024, Hydrock Consultants Ltd (Hydrock, now Stantec - referred to hereafter as Hydrock) was commissioned by Thakeham Concrete Products Ltd (the client) to support and assist the feasibility of groundwater abstraction for the proposed residential site known as Thakeham Tiles situated along Rock Road within Storrington, West Sussex, RH20 3AD.

The works have been undertaken in accordance with Hydrock's fee proposal referenced 08347-HYD-XX-XX-FP-GE-0006 dated 16 August 2024 and the client's instructions to proceed.

1.2 Background

This groundwater investigation has been instigated as a result of a Position Statement put forward by Natural England related to the water availability within the Sussex North Water Resource Zone, which means that all new developments within that area are required to demonstrate that the proposed development can achieve water neutrality. I.e. the development will not increase the Southern Water groundwater abstraction rate for drinking water supply which has the potential to have a negative impact on the wildlife site in the Arun Valley, specifically the Arun Valley SPA[1], Arun Valley SAC[2] and Arun Valley Ramsar[3] site. Consequently, Thakeham Tiles propose to make use of a groundwater abstraction borehole for use as a private drinking water supply for their proposed residential development.

The works have been commissioned with the objective to investigate the water abstraction potential within the Hythe Formation below the site.

1.3 Scope

The scope of the investigation comprises:

- Project management and liaison with contractors;
- Supervision of the drilling of one rotary borehole via open hole method to a maximum depth of 65m bgl to with the Hythe Formation (the target aquifer) to;
  - Obtain data on the ground and groundwater conditions of the site;
  - Allow collection of soil samples from hand dug starter pits for chemical laboratory analyses, prior to drilling;
  - Install a groundwater well;
  - Groundwater sampling for chemical laboratory analyses in line with the Private Water Supplies (England) Regulations 2016;
- Groundwater level monitoring; and
- Pumping test (step test and constant rate test).

The scope of the report comprises:

[1] SPA - Special Protection Area
[2] SAC - Special Area of Conservation
[3] Ramsar - wetland site of designated international importance

- Summary of the groundwater investigation;
- Review of third-party data; and
- Assessment of the water chemical and biological quality vs the 'drinking water standards'.

1.4 Available information

The following documents have been prepared by Hydrock for this site:

- Hydrock Consultants Ltd. July 2018. Desk Study and Ground Investigation – Rock Road, Storrington. Ref: TRS-HYD-XX-GI-RP-GE-1001;
- Hydrock Consultants Ltd. May 2021. Supplementary Ground Investigation Report – Thakeham Tiles Ltd. Ref: 08347-HYD-XX-XX-RP-GE-1002;
- Hydrock Consultants Ltd. January 2022. Supplementary Ground Investigation Factual Report – Thakeham Tiles. Ref: 08347-HYD-XX-XX-RP-GE-1003;
- Hydrock Consultants Ltd. April 2022. Supplementary Ground Investigation – Thakeham Tiles. Ref: 08347-HYD-XX-XX-RP-GE-1004;
- Hydrock Consultants Ltd. April 2022. Remediation Strategy and Verification Plan. Ref: 08347-HYD-XX-XX-RP-GE-3001;
- Hydrock Consultants Ltd. February 2024. Water Features Survey. Ref: 08347-HYD-XX-XX-TN-GE-1001;
- Hydrock Consultants Ltd. March 2024. Contaminated Land Risk Assessment Summary. Ref: 08347-HYD-XX-XX-TN-GE-1000;
- Hydrock Consultants Ltd. June 2024. Ground Investigation Specification. Ref: 08347-HYD-XX-SP-GE-1000; and
- Hydrock Consultants Ltd. September 2024. Abstraction Well Soil Sampling Assessment. Ref: 08347-HYD-XX-XX-TN-GE-1001.

1.5 Regulatory context and guidance

The investigation work has been carried out in general compliance with recognised best practice, including (but not limited to) BS 5930:2015+A1:2020, BS 10175:2011+A2:2017 and the AGS (2006) 'Good Practice Guidelines for Site Investigations'.

The geo-environmental section of this report is written in broad accordance with BS 10175:2011+A2:2017 and EA LCRM (2023).

Professional judgement is used to evaluate the findings of the assessment and to provide recommendations for the development.

All investigation work has been carried in line with relevant sections of the Water Resource Act (1991) including under the conditions set out in Groundwater Investigation Consent (Section 32(3).

2. Site details

2.1 Location

The site is located along Rock Road, Storrington, Pulborough with a postcode of RH20 3AD. The area is approximately centred on National Grid reference 510467E, 114878N and occupies an area of 4.86ha. A site plan is presented in Appendix A, with the site development and present site layout shown in Figure 2.1.

Figure 2.1: Site location

(Reproduced with permission from Groundsure)

2.2 The Site and Current land use

The site is occupied by an active concrete product manufacturing plant operated by Thakeham Tiles Ltd. The site can be split into two key areas, the northern half and southern half of site. The northern half towards Rock Road, sits at approximately 48m OD and comprises the main factory production facilities with warehouses and industrial units. The southern half, sits at approximately 64m OD and is used for aggregate storage. This area is also known to be a former quarry and subsequently a historic landfill which filled the resultant pit. Surrounding the majority of the site's facilities is woodland with residential properties beyond that to the east and west.

2.3 Site history

The site remained as coniferous and mixed woodland until the late 1920's, when the tile works opened and comprised of eight small to large buildings, a narrow-gauge railway with associated hoppers to the north and a sandpit to the south. Throughout the 1970's to 2000's there have been minor changes on site to the layout and ancillary buildings, but predominantly the site use has not changed since it's opening in 1929. The pit was noted to receive inert waste from the tile works, including surplus aggregate and concrete products.

3. Hydrogeology

3.1 Regional Geology

Storrington, which is situated within the South Downs of West Sussex, is part of the Wealden District that covers parts of Kent, Surrey and Hampshire. The Wealden District is characterised by various anticlines and synclines which form ridges and valleys, the most prominent and central feature is known as the Weald Anticline (also known as the Greenhurst Anticline). The axis of the Weald Anticline is situated north of the site striking east to west with the site being on the southern limb and the geological units underlying dipping to the south at approximately 5°.

The Wealden District is also divided into two main belts, the Northern and Southern belts, distinguished by their geological compositions. The Northern belt comprises the Chalk Group, Gault Clay and Upper Greensand with the Southern belt comprising the Chalk Group and Lower Greensand Group. The chalk has largely been eroded away within the Storrington area and exposes the older rock formations of the Lower Greensand Group, which can be split into four formations: Atherfield Clay, the Hythe Formation, the Sandgate Beds (which includes the Fittleworth Member) and the Folkestone Formation. Figure 3.1 shows the Greenhurst Anticline within the Weald Clay Formation in relation to the site, as well as the above-mentioned units of the Lower Greensand Group outcrop, which are summarised in Table 3.1.

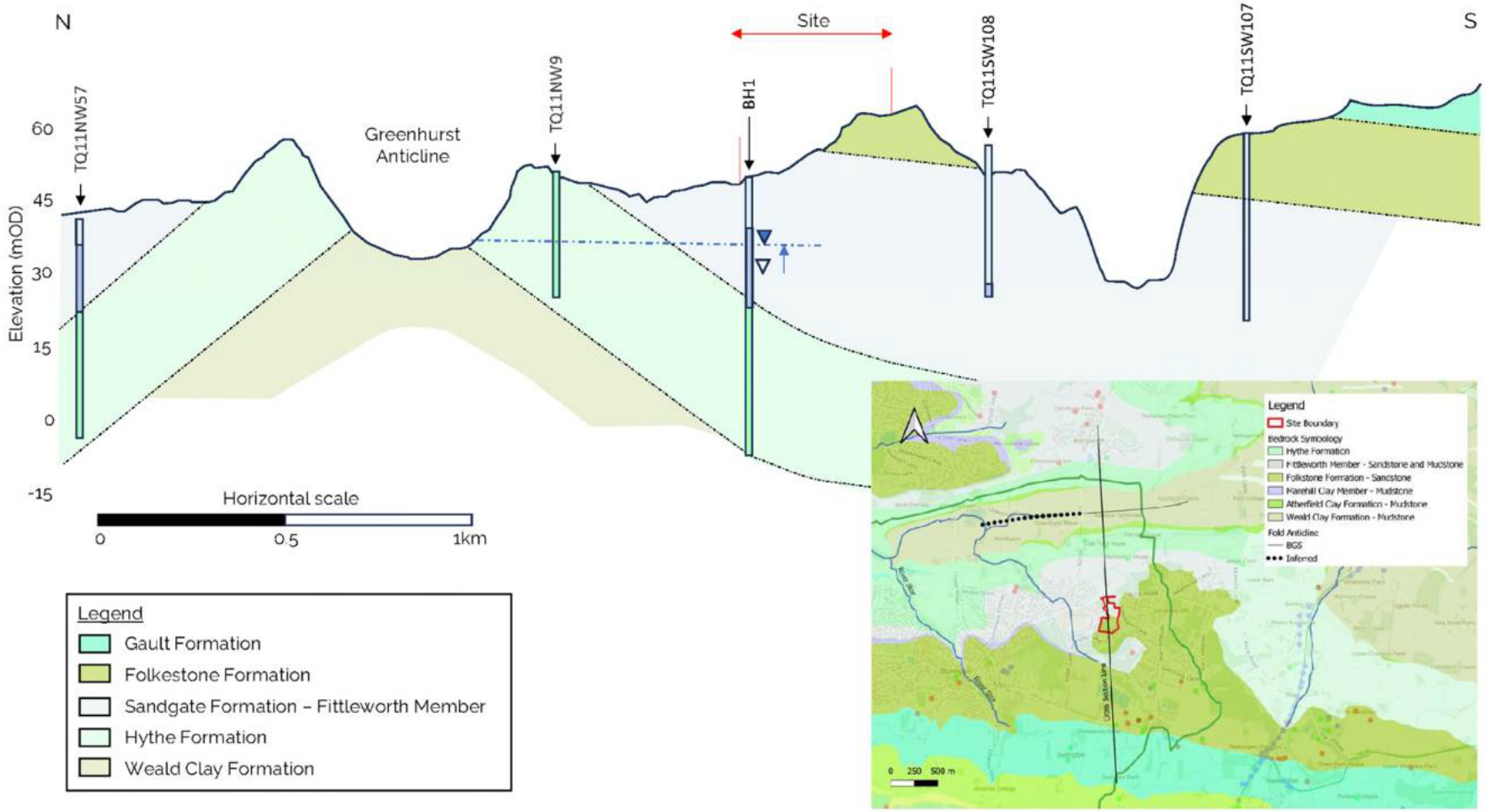

Figure 3.1: Conceptual geological model

Table 3.1: Summary of geological units of the Southern Belt

Group	Formation	Thickness (m)	Description
Lower Greensand Group	Folkestone Formation	0.50 - 80	Medium and coarse grained, well sorted cross-bedded sands and weakly cemented sandstones.
	Sandgate Beds (Fittleworth Member)	10 - 60	Glauconitic sandy clays and clayey sands. Orange brown where weathered; bright green where unweathered.
	Hythe Formation	18 - 100	Fine to medium grained, sparsely glauconitic sands, sandstones and silts, locally pebbly with calcareous or siliceous cement.
	Atherfield Clay Formation	18	Massive yellowish brown to pale grey sandy mudstone. Phosphatic pebble bed, gritty sandstone or shelly sandy glauconitic mudstone towards the base.
Wealden Group	Weald Clay Formation	122 - 460	Dark grey thinly-bedded mudstones (shales) with siltstones, fine to medium grained sandstone, shelly limestones and clay ironstones.

3.2 Site Geology

Much of the geology encountered on site has comprised mostly of the Lower Greensand Group. The higher ground towards the south of the site is underlain by the sands and weakly cemented sandstones of the Folkestone Formation which overlies the sandy clays and clayey sands of the Fittleworth Member. In the lower ground, towards the north of the site, the Folkestone Formation is absent and the site is underlain by the Fittleworth Member. No natural superficial deposits are recorded across the site overlying the bedrock geology. Generally Made Ground beneath the site is thin and shallow (with an average thickness of 1.64m in the north of the site and 2.39m in the south of the south), but locally thicker Made Ground was encountered in the northern area and worked ground associated with the southern quarry area up to a maximum thickness of 5.47m.

The absence of the Folkestone Formation within the northern half of site, is consistent with the BGS mapping where the apparent contact between the Folkestone and Fittleworth bisects the site. An indicative cross section is presented in Figure 3.2 below (drawing reference: TRS-HYD-XX-XX-DR-GE-1009) from the geology encountered on the site during Hydrock's previous investigation. The deepest borehole was drilled to 20m bgl, identified within the Fittleworth Member. It is expected that the transition to the Hythe Formation will occur deeper than 20m bgl but less than 56m bgl.

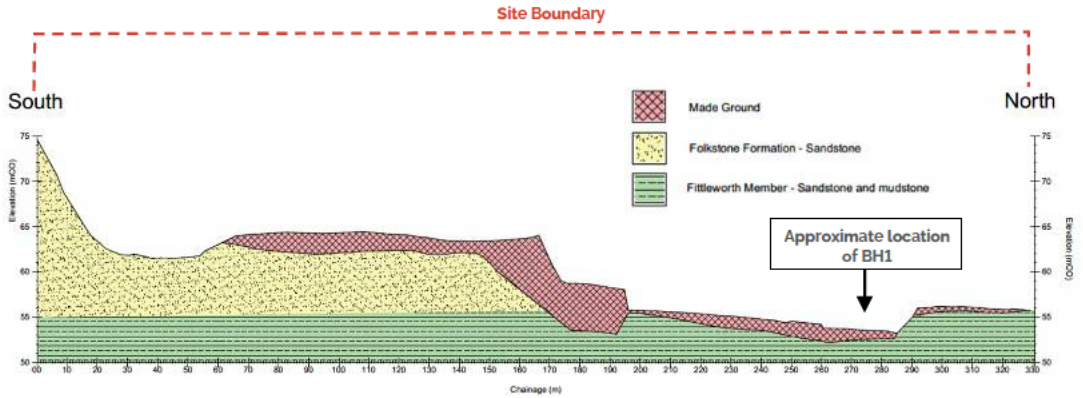

Figure 3.2: Indicative geological cross section of site.

3.3 Hydrogeology and aquifer properties

The site is situated within the Hardham Basin groundwater management unit (GWMU) which is part of the Arun and Western Streams abstraction licensing area. The Hardham Basin is formed of the Folkestone Formation and Hythe Formation Principal aquifer separated by the Sandgate Formation (Fittleworth Member) Secondary A aquifer. Due to the position of the Folkestone Formation underlying the quarry/landfill area of site and being situated a distance away from the entrance of site, it is not feasible to abstract from this stratum. Furthermore, abstraction from the Folkestone Formation is currently prohibited in the Hardham Basin due to concern that abstraction could potentially be impacting on the designated sites within the Arun Valley (SAC, SPA, SSSIs and Ramsar site), located around 8 km west of the site.

A borehole prognosis report undertaken by WSP (reference: 62241301/001/R370, dated July 2023), concluded from borehole records, that boreholes drilled into the Hythe Formation, which is classified as a Principal aquifer, could obtain the yield required for the development (approximately 64m^3/d).

The Hythe Formation and Folkestone Formation aquifers are part of the Lower Greensand Group. These two aquifers are separated by the Sandgate Formation in this region which includes the Fittleworth Member and due to the clay content acts as an aquitard. This means the Hythe Formation aquifer is confined by the overlying Fittleworth Member and is hydraulically separated from the overlying Folkestone Formation.

The Hythe Formation is a dual porosity aquifer, whereby groundwater flows via a combination of intergranular flow through poorly consolidated sands (primary porosity) and along fractures (secondary porosity). The secondary porosity can contribute significantly to the permeability and flow, especially in cemented sandstones. The reported geometric mean of transmissivities is 310 m^2/day with a range of 140-1500m^2/day. Clay and silt bands can give rise to perched groundwater. The range in storage coefficient is 0.08 to 1x10^{-5} with a geometric mean of 6 x10^{-4}. The Lower Greensand Group aquifers are known to be highly productive, with yields up to 50l/s reported with flow rates in and western outcrops of 18 to 45l/s[4].

[4] BGS. (1978). Hydrogeological map of the South Downs and the adjacent part of the Weald including parts of hydrometric areas 39, 40, 41 and 42. Scale 1:100,000.

3.4 Existing groundwater wells

Table 3.2 details the active licenced groundwater abstractions within the catchment and their annual and daily flow rates. Their location is shown on Figure 3.3. With the exception of SO/041/0025/012, there are no BGS borehole records associated with these abstractions and so it is not possible to determine whether they abstract from the Hythe Formation or another aquifer. Groundwater abstraction licenses are available within the Groundsure Report presented in Appendix H.

Table 3.2: Details of licensed groundwater abstractions near to the site

License Reference	Name	Aquifer	Annual Volume (m^3)	Maximum Daily Volume (m^3)
25/084 (A)	Cemex UK Materials UK	Folkestone Formation	250000	910
SO/041/0025/006 (Inactive)	Cemex UK Materials UK	Folkestone Formation	2295120	6288
25/084 (B)	Cemex UK Materials UK	Folkestone Formation	250000	910
SO/041/0025/012 (B)	Croudace Homes Limited	Folkestone Formation	11805	33
SO/041/0025/012 (A)	Croudace House Limited	Folkestone Formation	11805	33
10/41/415407	Dudman Chantry Ltd	Folkestone Formation	99000	660
23/073	D J Squire & Company Ltd	Hythe Formation	8000	40

The BGS hold records for 20 water wells within 2km of the site. The range of yields tested within these wells range from 0.11 to 0.53l/s (or 10 to 46m^3/day). Figure 3.3 shows the location of thirteen water wells within the Arun Lower Operational Catchment Area which were constructed to abstract water from the Lower Greensand Group or the Hythe Formation aquifers. These water wells do not coincide with the licensed abstractions in Table 3.2 suggesting they are either no longer operational or they are abstracting no more than 20m^3/day and are therefore exempt from licencing.

The depths to groundwater, or rest groundwater levels, for the 20 BGS water wells indicates a range between 10 and 35m bgl (36.5m OD to 52.1m OD).

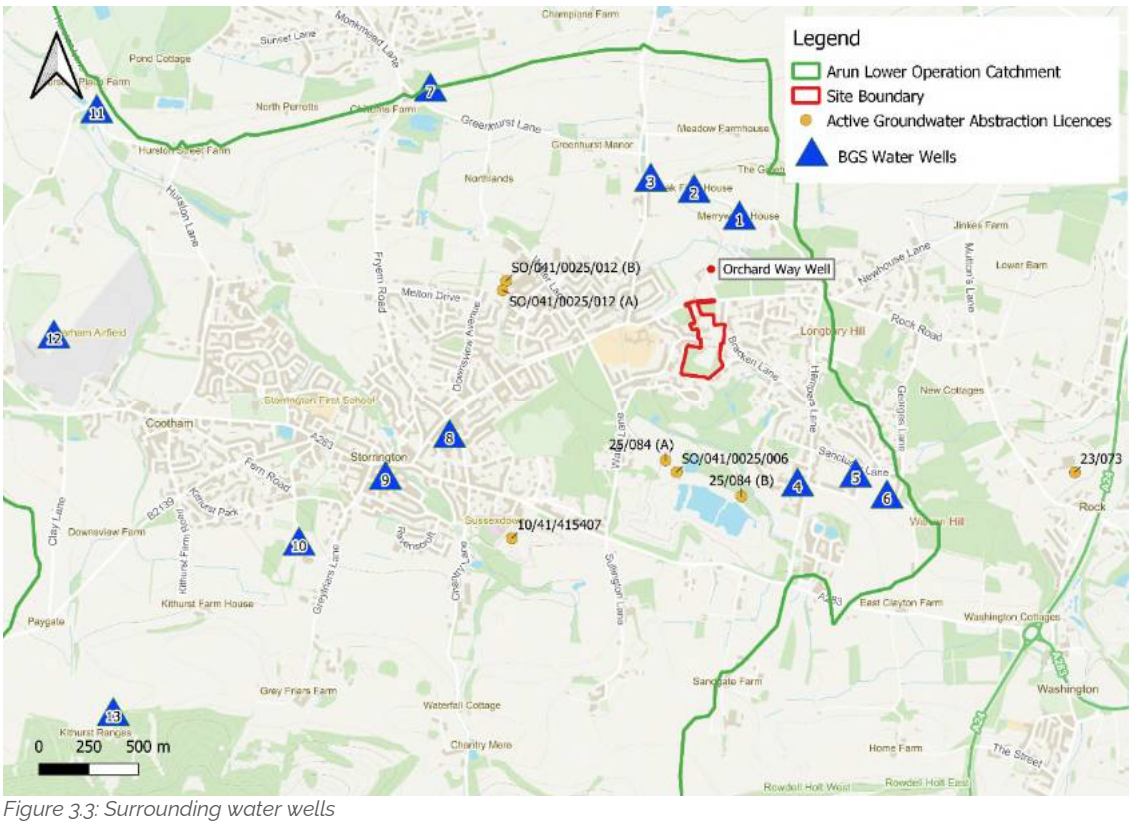

Figure 3.3: Surrounding water wells

3.5 Water budget

3.5.1 Aquifer recharge

The Enhanced Future Flows and Groundwater (eFLaG) dataset is a recently published set of nationally consistent climatological and hydrogeological projections based on the UKCP18 climate projections project[5]. The eFLAG datasets provide an assessment of changes in groundwater recharge for the UK groundwater bodies and is split into baseline, near future (2020 to 2049) and far future (2050 to 2079). The output of the modelling is available on the UK Centre for Ecology and Hydrology website. Figure 3.4 is a box plot summarising the monthly average recharge for the Lower Greensand Arun and Western Streams Groundwater body which underlies the site. The groundwater recharge changes are viewed as three slices of time throughout each month of the year:

- Baseline (BL): 1989 – 2018;
- Near Future (NF): 2020 – 2049 and
- Far Future (FF): 2050 – 2079.

[5] UK Centre for Ecology and Hydrology, 2023. Enhanced Future Flows and Groundwater Portal

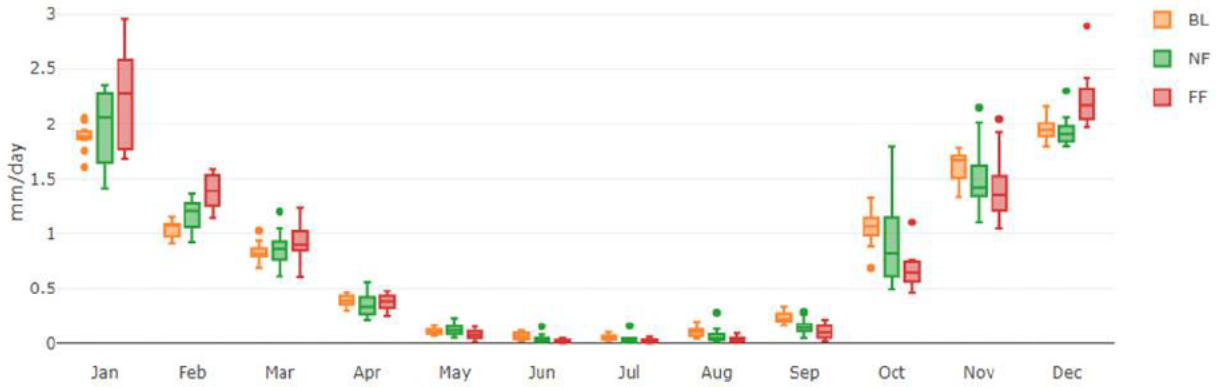

Figure 3.4: Groundwater recharge of the Lower Greensand Arun & Western Streams
Enhanced Future Flows and Groundwater (eFLaG) Portal

Table 3.3 summarises the quartile 1, quartile 3 and median data from the box plot graph from Figure 3.4 from January to December for the baseline, near future and far future projections.

Table 3.3: Lower greensand Arun & Western Streams summary of monthly absolute changes (mm/day)

Month	Baseline (BF) mm/day			Near Future (NF) mm/day			Far Future (FF) mm/day		
	Q1	Q3	Median	Q1	Q3	Median	Q1	Q3	Median
January	1.86	1.92	1.88	1.64	2.27	2.06	1.77	2.57	2.27
February	0.97	1.09	1.07	1.05	1.27	1.21	1.25	1.53	1.39
March	0.79	0.87	0.82	0.76	0.93	0.86	0.85	1.02	0.90
April	0.35	0.43	0.38	0.27	0.42	0.33	0.32	0.43	0.38
May	0.08	0.12	0.09	0.08	0.15	0.11	0.05	0.11	0.07
June	0.03	0.09	0.06	0.01	0.05	0.02	0.01	0.03	0.02
July	0.03	0.07	0.04	0.01	0.04	0.02	0.01	0.03	0.01
August	0.07	0.12	0.10	0.03	0.08	0.04	0.02	0.05	0.03
September	0.20	0.27	0.22	0.11	0.18	0.14	0.05	0.16	0.10
October	0.98	1.15	1.06	0.61	1.15	0.82	0.56	0.74	0.64
November	1.51	1.71	1.66	1.34	1.61	1.42	1.04	1.52	1.35
December	1.89	2.01	1.94	1.84	1.97	1.90	2.05	2.32	2.17

Figure 3.5 shows an area of the Hythe Formation outcrop (highlighted in blue hatching) to the north of the site, which we have inferred to be the most likely recharge area for the Thakeham Tiles borehole. A conservative catchment area has been used to be able to calculate the monthly recharge of the groundwater body however, it is likely that this area could continue west over the Arun Lower Operational Catchment. The recharge area is also likely to be constrained by the Greenhurst Anticline fold axis and by the tributary west of the River Stor.

The approximate surface area of the Hythe Formation outcrop is calculated as 381,500m². Using the monthly expected rainfall in Table 3.3 and the inferred Hythe Formation outcrop area, the monthly recharge of the Hythe Formation aquifer has been estimated for the baseline and near future scenarios (Q1, median and Q3) and is summarised in Table 3.4. The data suggests the total groundwater recharge is expected to be similar for baseline and near future cases, however there is a bigger range in values in the near future when compared to baseline.

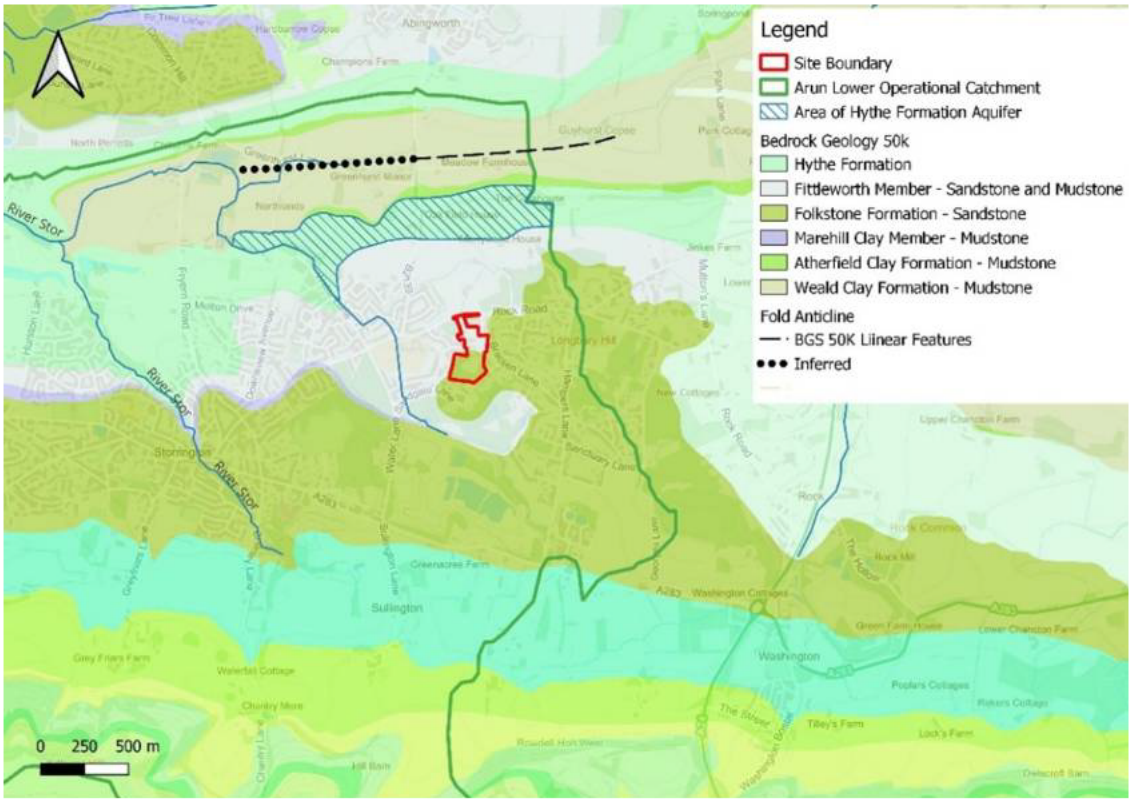

Figure 3.5: Geology and associated features within the Lower Arun Operational Catchment.

Table 3.4: Projected volume of monthly recharge in the area of the Lower Greensand Arun & Western Streams groundwater body

Month	Baseline (BF) m³			Near Future (NF) m³		
	Q1	Q3	Median	Q1	Q3	Median
January	21,997	22,707	22,234	19,395	26,846	24,363
February	10,362	11,643	11,430	11,216	13,566	12,925
March	9,343	10,289	9,698	8,988	10,999	10,171
April	4,006	4,921	4,349	3,090	4,807	3,777
May	946	1,419	1,064	946	1,774	1,301
June	355	1,064	710	118	591	237
July	343	801	458	114	458	229
August	828	1,419	1,183	355	946	473

Month	Baseline (BF) m^3			Near Future (NF) m^3		
	Q1	Q3	Median	Q1	Q3	Median
September	2,289	3,090	2,518	1,259	2,060	1,602
October	11,590	13,600	12,536	7,214	13,600	9,698
November	17,282	19,571	18,999	15,336	18,426	16,252
December	22,352	23,771	22,943	21,761	23,298	22,470
Total	**101,693**	**114,297**	**108,121**	**89,794**	**117,372**	**103,497**

3.5.2 *Groundwater abstraction*

The flow rate for the proposed borehole will be a maximum of 64m^3/day which is around 23,360m^3/ year which is significantly less than the anticipated recharge of the aquifer.

As expected towards the end of the spring and over the summer months (the drier periods of the year), the estimated recharge will be lower than the abstraction volume. However, it is expected that the overall impact on the water availability within the aquifer will not result in an adverse impact.

The Cemex boreholes and majority of the BGS wells abstract from the Folkestone Formation, which is hydraulically separated from the Hythe Formation.

3.5.3 *Other groundwater outflows*

Given that the Hythe Formation is confined within the catchment, except at outcrop in the north, it is considered that a negligible flow from the Hythe Formation discharges into the river networks within catchment. Consequently, most of the flow is considered to exit the catchment via groundwater flow through the aquifer down hydraulic gradient.

4. Investigation works

4.1 Consents

A Ground Investigation Consent (GIC) was issued by the Environment Agency (EA) to Hydrock on behalf of the client (Consent No: S/2024/341) in order to carry out the investigation works, comprising of drilling a borehole to a maximum depth 65m bgl within the Hythe Formation, obtain soil and groundwater samples and undertake pumping tests to record the capabilities of abstracting groundwater from the well.

As well as a schedule of general conditions, a number of special conditions were stipulated within the GIC. These are summarised below:

- The Consent Holder shall undertake chemical testing of the soils within the borehole starter pit to ensure there is no contamination present, prior to the construction of the borehole;
- The Consent Holder shall undertake chemical testing of the groundwater within the borehole to ensure there is no contamination present prior to discharging any abstracted waters to ground and prior to the test pumping of the boreholes;
- The Consent Holder shall carry out test pumping and measurement of water levels using a preliminary step test and constant rate test;
- Pumping rates shall not exceed a maximum of 6m^3/hr during the step tests and 3.5m^3/hr during the constant rate tests;
- In addition to groundwater monitoring in the borehole being tested, the Consent Holder is required to monitor the well at Orchard Way Farm (NGR: TQ 10838 15215).

Full details of the GIC are presented in Appendix B.

4.2 Borehole drilling

4.2.1 Soil sampling

The starter hand pit for BH1 was undertaken on 27 August 2024 and was excavated to a depth of 1.25m bgl. Three environmental samples of the soil within the hand pit were taken, stored and transported in general accordance with BS 10175:2011+A2:2017. A short letter report (reference: 08347-HYD-XX-XX-RP-GE-1001), discussing the analysis and assessment of the soil results were submitted to the EA and showed no contamination to be present within the Made Ground and underlying natural soils. The full report is presented in Appendix C.

4.2.2 Drilling method

BH1 was then subsequently drilled, via rotary open hole method, between the 9 and 13 September 2024 to a final depth of 58m bgl as shown on the exploratory hole location plan (reference: 08347-HYD-XX-XX-DR-GE-1011) presented in Appendix A. The log, including details of ground conditions, soil sampling depths and well installation details are presented in Appendix D.

4.2.3 Ground conditions encountered

The following presents a summary of the ground and groundwater conditions encountered, based on field and drilling observations. It is noted that due to the open hole drilling method used that the descriptions and base of strata is approximate and interpreted based on

geological judgement. A summary of the ground model is presented in Table 4.1 and the individual strata are described in Sections 4.2.4 to 4.2.7.

Table 4.1: Strata encountered

Stratum	Depth to top (m bgl)	Depth to base (m bgl)	Depth to base (m OD)	Thickness (m)
Surface covering – Concrete hardstanding	0	0.30	50.29	0.30
Made Ground	0.30	0.50	50.09	0.20
Fittleworth Member	0.50	~27	23.59	~26.50
Hythe Formation	27	58*	-7.41	~31.50

~ estimated, due to inferred transition from Fittleworth to Hythe

** Base of stratum not proven*

4.2.4 Surface covering

Concrete hardstanding 300mm thick was recorded from surface level. This was recovered and described as cream, slightly sandy gravels and cobbles of concrete and flint. Sand is fine to coarse.

4.2.5 Made Ground

Below the concrete hardstanding 200mm of Made Ground was encountered to a depth of 0.50m bgl, comprising of brown gravelly sand with gravels and cobbles of concrete, flint and brick.

4.2.6 Fittleworth Member

Fittleworth Member was encountered underlying the Made Ground from 0.50m bgl to approximately 27m bgl. The composition of the unit varied with depth and descriptions beyond the hand pit of 1.25m bgl are noted as 'probably' due to the limited and very disturbed nature of the recovered sample from the method of open hole drilling. A summary of the descriptions and depths are as follows:

- 0.50 – 1m bgl: Very soft orange brown very sandy clay.
- 1 – 1.25m bgl: Soft grey mottled orange brown sandy clay.
- 1.25 – 11m bgl: Probably dark grey sandy clay with pockets of orange brown sand.
- 11 – 27m bgl: Probably dark grey clayey sand with fine gravels of glauconitic sandstone.

At around 22m bgl; Drilling flush colour changed to green from grey. This change in flush colour is a likely indication of the unweathered state of this member, as green glauconitic, sandy clay and clayey sands are commonly found where there is reduced amounts of weathering in the unit.

4.2.7 Hythe Formation

The Hythe Formation transition/boundary from the Fittleworth is inferred due to difficulties in defining the two units, not only because of the similarities geologically but also due to the drilling method used, which produced limited and very disturbed samples of the material. Subsequently the summary description and depth is noted as 'probably':

» 27m bgl – 58m bgl: Probably fine and medium glauconitic sandstone. Recovered as dark grey sandy fine and medium gravels of glauconitic sandstone and chert.

4.2.8 Obstructions

At 45.5m bgl loss of arisings was noted during drilling and change in pressure by the lead driller. This is likely due to a probable fracture being encountered within the Hythe Formation, the thickness and size of this fracture is unknown, however recovery of any samples from this depth to base was subsequently lost. It is considered that the Hythe Formation continues from 45.5m to 58m bgl due to no significant changes noted by the drillers after encountering the fracture.

4.2.9 Well details

The well liner was installed in BH1 to a depth of 56.07m bgl, this was due to collapse of the deepest part of the borehole during the installation process. 250mm diameter steel outer casing was permanently installed from ground level to 5m bgl with a 126mm internal diameter (ID) UPVC plastic pipe installed inside the steel casing from ground level to the base. From 31.63m to 55.07m bgl, the section of this pipe comprised of 2mm slots and was surrounded by 3-6mm gravel. The plain section was surrounded with bentonite clay pellets to ground surface to create a seal. The last remaining 1m of pipe below the slotted section was also a plain section of plastic pipe to act as a sump to any infiltrating sediment.

Table 4.2 provides a summary of the monitoring installation and full installation details can be seen on the exploratory hole log and drillers logs presented in Appendix D.

Table 4.2: Summary of monitoring installation

Location	Ground level (m OD)	Internal well diameter (mm)	Screen top and base depth (m bgl)	Screen top and base depth (m OD)	Strata targeted
BH1	50.59*	126	31.63 – 55.07	18.96 - -5.48	Hythe Formation

*Approximate level

4.2.10 Groundwater levels

The manual groundwater levels recorded during the drilling and pump testing are summarised in Table 4.3.

Table 4.3: Manual groundwater levels recorded within BH1

Date	Depth of groundwater (m bgl)	Time (hh:mm)	Comments
27/09/2024	1.25	11:00	Slow groundwater seepage at base of handpit

Date	Depth of groundwater (m bgl)	Time (hh:mm)	Comments
11/09/2024	19.8	09:48	Initial strike during drilling. Rose to 12.25m bgl after 40minutes
11/09/2024	14.40	17:30	-
12/09/2024	14.40	08:00	-
12/09/2024	13.65	17:30	-
13/09/2024	14.20	08:00	-
23/09/2024	14.37	11:00	Pumping test set up and test equipment
24/09/2024	14.42	08:00	Start of step test
24/09/2024	14.43	16:00	Start of constant rate test
25/09/2024	14.425	08:00	Middle of constant rate test

4.3 Aquifer testing

The pumping tests were undertaken between the 24 and 26 September 2024. Full details of the aquifer testing, and data recorded by Project Dewatering, are presented in Appendix E. All measurements throughout the pumping tests were monitored with data loggers, as well as manual water level dips.

4.3.1 Equipment and set up

The works included the installation of a pump to the wellhead of BH1 associated pipework and equipment to undertake the following pumping tests. The submersible pump was installed at a depth of 50.455m bgl.

4.3.2 Step test

The step test began on the 24 September 2024 and comprised of five steps, lasting 60 minutes each. Starting from a flow rate of 0.56l/s (48 m^3/day) to a flow rate of 1.67/s (144 m^3/day). Drawdowns encountered throughout the test ranged from 0.01m to 0.035m. Once the step test had completed, recovery of the well was undertaken for approximately 1 hour and 40 minutes and the water returned to initial conditions within 20 minutes.

4.3.3 Constant rate test

The well recovered to initial groundwater level that same day and the constant rate testing was started at a pumping rate of 0.96l/s (c. 84m^3/day) for 24 hours. A drawdown of -0.005m was recorded. This negative drawdown was most likely impacted by the intermittent rain recorded during the later stages of the constant rate test.

4.3.4 Monitoring

During the pumping tests, the EA required monitoring of a nearby brick-lined water well situated at Orchard Farm Way, named hereafter as the Orchard Way Well, this was identified during the Water Features Survey undertaken on 5 February 2024. The location of the well is shown below in Figure 4.1. As well as spot monitoring, a water level logger was installed to take continuous readings prior to the pumping tests and throughout. A barometric logger was also installed just inside the well above ground level. The well was raised above ground level however, all readings within Table 4.4 were taken from surface level. The depth of the well was recorded to be 3.20m bgl.

Figure 4.1: Location of the Orchard Way Well at Orchard Farm Way

Table 4.4: Manual groundwater levels recorded within Orchard Way Well

Date	Depth of groundwater (m bgl)	Time (hh:mm)	Comment
27/08/2024	1.46	11:45	-
09/09/2024	1.00	11:30	Logger installed at 11:39 and barometric logger installed at 11:40
13/09/2024	1.25	09:25	Loggers checked and preliminary data downloaded at 9:30. Loggers re-installed at 10:00
24/09/2024	1.085	11:40	-

Date	Depth of groundwater (m bgl)	Time (hh:mm)	Comment
25/09/2024	1.125	14:49	-

4.4 Discharge water quality testing

4.4.1 Sampling

It was not possible to discharge the pumping test water to foul sewer, therefore discharge to surface water was required. Samples of groundwater were therefore collected following the well development stage to confirm an absence of contaminants that may pose a risk to surface water quality. The geo-environmental analyses undertaken on the water is summarised in Table 4.5.

Table 4.5: Geo-environmental analyses of water

Determinand Suite	Groundwater
Hydrock minimum suite of determinands for waters [6]	1
Speciated aliphatic and aromatic banding Total petroleum hydrocarbons by HS-GC/MS and GC/FID (Hydrock Tier 2 TPH Suite)	1
Benzene, toluene, ethylbenzene and xylene (BTEX) by HS-GC/MS	1
MTBE (Methyl Tertiary Butyl Ether) by HS-GC/MS	1

[1]The Hydrock minimum suite of determinands for waters comprises As, B (water soluble), Be, Cd, Cr (total), Cr(VI), Cu, Hg, Ni, Pb, S (elemental), Se, V, Zn, cyanide (total), sulfide, pH, asbestos fibres, speciated polynuclear aromatic hydrocarbons (PAH, by GC-FID), total phenols, fraction of organic carbon and free and "complex" cyanide species, if high total cyanide is detected.

4.4.2 Assessment results

The results of the groundwater analysis were compared to Environmental Quality Standards (EQS) for inland waters. The groundwater data sheets are presented in Appendix F. Based on the data comparison against the EQS the results indicate a slight exceedance in two parameters, these are outlined in Table 4.6.

The minor exceedance of copper and zinc were considered a very low risk to surface water, due to the short duration and small volume that will be discharging to ground during the pumping tests. Consequently, it was agreed with the EA that discharge to surface water at the site boundary was acceptable and could take place for the pumping test.

[6] Hydrock minimum waters/soil leachate analysis suite comprising — Ag, Al, As, B, Ba, Cd, Co, Cr (III), Cr(VI), Cu, Fe, Hg, Mn, Mo, Na, Ni, Pb, Sb, Se, Sn, Zn, V, cyanide (total), phenols (total), ammonium, bromate, chloride, fluoride, nitrate, nitrite, sulfate, PAH (speciated), pH, EC and hardness

Table 4.6: Geo-environmental analyses of water

Parameter	Freshwater Annual Average EQS	Concentration (µg/l)
Copper	1	1.4
Zinc	10.9	12

4.5 Drinking water quality testing

Groundwater samples were also collected on three occasions during the duration of the pumping tests. This was so the water quality could be analysed and compared to the prescribed concentrations as set out in the Private Water Supplies (England) Regulations 2016. A specialised suite of testing was therefore undertaken as per the microbiological and chemical determinands outlined by the Private Water Supplies (England) Regulations 2016. The results and analysis of these results are presented in Section 6.2.

Additionally, water quality readings were measured in situ using a calibrated YSI ProPlus multiparameter water quality meter as set out below:

- pH;
- Redox potential (Eh);
- Dissolved oxygen (DO);
- Temperature; and
- Specific conductivity.

5. Borehole productivity

5.1 Pumping test analysis

The step test and constant rate tests undertaken in BH1 resulted in very minimal drawdown in groundwater level (see Figure 5.1). It is not possible to analyse the groundwater data with any certainty to obtain aquifer parameters or infer sustainable drawdown using traditional analytical methods. It is likely that the limited drawdown is a combination of the following factors:

- The relatively low abstraction rate used during the testing;
- The high permeability of the Hythe Formation, which is likely to be towards the higher end of the range of reported values due to the presence of a fracture; and
- High rainfall occurring in the days immediately prior to and during the pumping test - see below.

5.2 Effects of rainfall

Groundwater data was recorded throughout the drilling and pumping tests from level loggers installed within BH1 and the Orchard Way Well located 150m north west from site. This has been plotted alongside data recorded from the Storrington rainfall station available from the EA Hydrology Data Explorer[7] on graphs presented within Appendix G.

The rainfall data for the area shows a clear correlation to the groundwater level data collected from the Orchard Way Well. A groundwater level rise occurs within around 24 to 48 hours after significant rainfall events. Due to the Orchard Way Well depth being approximately 3.20m bgl, this is likely being recharged within the shallow bedrock of the Fittleworth Member, explaining the relatively quick response in groundwater rise.

The groundwater levels recorded within BH1 within the deeper bedrock of the Hythe Formation, are noted to remain at steadier levels, with only a slight decrease in groundwater level recorded at the start of the pumping tests on the 23 September noted. The groundwater level throughout the pumping tests remained at a steady level with very little drawdown (between 0.01 and 0.035m), even when flow rates were increased. During the constant rate testing a negative 0.005m drawdown was recorded. It is considered likely that a rise in groundwater level occurred within the Hythe Formation during the aquifer testing, potentially with a longer lag time and less pronounced due to the higher permeability of the fractured Hythe Formation.

The EA 'Pulborough Brooks 11' groundwater observation well located 5.2 km to the northwest from the site recorded an increase in water level from a level of 2.404m OD on the 22nd September 2024 to 2.597m OD on the 23rd September 2024 and continued to rise to 2.619m OD on the 26th September 2024[8]. Trends of groundwater level in response to rainfall follow a similar pattern to the groundwater level rise observed in the Orchard Way Well, but with a lower magnitude.

[7] https://environment.data.gov.uk/hydrology/station/d0de6bdf-d02b-488c-9273-1cab0a389045
[8] https://environment.data.gov.uk/hydrology/station/6c204335-8147-4f7f-a834-b051f27a5a0c_244150008

Figure 5.1: Pumping test groundwater levels and flow rate

5.3 Estimated drawdown

In the absence of drawdown data from the pumping test, an estimate of the steady state drawdown in BH1 has been calculated using the Thies method which is suitable analytical equation for assessing flows and drawdown for a confined aquifer. Two estimates have been calculated, one using a transmissivity value of 310 m^2/day and a second using a value of 1,500 m^2/day which is considered to be more representative of the aquifer at the site due to the presence of a fracture at 45m. Based on an assumed storage coefficient of 6 $x10^{-4}$ the drawdown in the well is expected to be between 0.1 and 0.5m. This is consistent with the very low drawdown observed during the pumping test.

5.4 Conclusion

Despite the pumping test not providing data suitable to provide an analysis using traditional methods, the aquifer is expected to have a high permeability due to the presence of a fracture at around 45.5m deep. Drawdown is therefore expected to be minimal during long term pumping on the basis that the proposed flow rate is less than the aquifer recharge within the catchment of the borehole and the high permeability of the aquifer. It is considered that the abstraction at the proposed rate will not have a long-term adverse impact on groundwater levels within the aquifer.

6. Water quality analysis

Groundwater samples were collected by Hydrock on three occasions during the constant rate test undertaken by Project Dewatering. These samples were then sent for laboratory analysis undertaken by i2 Analytical, RPS Environmental and ALS Laboratories. Hydrock collected in-situ water quality readings on all occasions and periodically during the testing. A summary of the results are presented in Table 6.1 with full data sheets presented in Appendix F.

6.1 Insitu Water Quality Parameters

In-situ readings from the water being pumped out of BH1 were taken at intervals through the pumping tests. These results are summarised in Table 6.1.

Table 6.1: In situ water quality data from BH

Date (dd/mm/yyyy) Time (hh:mm)	Temperature (°C)	Sp. Cond (µS/cm)	D.O (mg/l)	pH	ORP (mV)	Comment
23/09/2024						
13:42	12.6	600.7	17.27	7.31	175.3	During step testing
13:56	15.1	587	10.91	7.35	49.4	
24/09/2024						
16:00	12.6	599	9.12	7.29	117.7	Beginning of constant rate testing **(P1 sample taken)**
25/09/2024						
08:39	12.3	601.2	8.75	7.26	112.1	During constant rate testing **(P2 sample taken)**
08:50	12.7	595.3	7.92	7.27	30.3	
25/09/2024						
11:28	12.6	605.9	11.72	7.25	71.3	During constant rate testing
11:38	13.1	599.2	10.57	7.25	9.1	
25/09/2024						
13:19	12.6	602.3	9.58	7.27	56.8	During constant rate testing
13:28	13.1	596.2	9.12	7.26	3.6	
25/09/2024						
15:15	12.5	603.9	3.34	7.25	47.7	End of constant rate testing **(P3 sample taken)**
15:25	13.3	599.1	1.04	7.26	-3.4	

6.2 Water quality results

The water quality results are split into three tables, as outlined within the Private Water Supplies (England) Regulations 2016. The regulations aim to safeguard public health by ensuring that water supplies are safe to drink. The prescribed concentrations or value in relation the parameters below is the maximum or minimum concentration or value specified in relation to that parameter. It is noted that the prescribed maximum concentration/ values are for drinking water at the point of consumption and not for untreated groundwater samples.

The results of the three samples – P1, P2 and P3 are compared with the maximum concentration/values provided below in Table A, Table B and Table C.

Table A: Microbiological Parameters

Prescribed concentrations/values

Parameter	Unit of measurement	Maximum concentration /value*	BH1 - P1 24/09/24 15:40	BH1 - P2 25/09/24 08:00	BH1 - P3 25/09/24 15:00
E.coli	cfu/100ml	0	0	0	0
Enterococci	cfu/100ml	0	6	0	0
Total Viable Count at 22°C	cfu/ml	100	>1000	>1000	>1000

**as per The Private Water Supplies (England) Regulations 2016*

Table B: Chemical Parameters

Parameter	Unit of measurement	Maximum concentration /value*	BH1 - P1 24/09/24 15:40	BH1 - P2 25/09/24 08:00	BH1 - P3 25/09/24 15:00
Part I: Directive requirements - prescribed concentration/values					
Acrylamide	µg/l	0.10	<0.1	<0.1	<0.1
Antimony	µg/l	5.0	0.6	0.5	<0.4
Arsenic	µg/l	10	0.56	0.29	0.35
Benzene	µg/l	1.0	<3.0	<.3.0	<3.0
Benzo(a)pyrene	µg/l	0.010	<0.01	<0.01	<0.01
Boron	mg/l	1.0	0.039	0.038	0.036
Bromate	µg/l	10	<2	<2	<2
Cadmium	µg/l	5.0	<0.02	<0.02	<0.02
Chromium	µg/l	50	<0.2	<0.2	<0.2
Copper	mg/l	2.0	0.0012	0.001	0.0032

Parameter	Unit of measurement	Maximum concentration /value*	BH1 - P1 24/09/24 15:40	BH1 - P2 25/09/24 08:00	BH1 - P3 25/09/24 15:00
Cyanide	µg/l	50	<10	<10	<10
1,2 dichloroethane	µg/l	3.0	<3.0	<3.0	<3.0
Epichlorohydrin	µg/l	0.10	<0.10	<0.10	<0.10
Fluoride	mg/l	1.5	0.13	0.14	0.14
Lead	µg/l	10	<0.2	<0.2	<0.2
Mercury	µg/l	1.0	<0.05	<0.05	<0.05
Nickel	µg/l	20	2.8	1.5	1.6
Nitrate as NO_3	mg/l	50	0.05	0.05	0.05
Nitrite as NO_2	mg/l	0.5	<0.005	<0.005	<0.005
Pesticides					
Aldrin	µg/l	0.030	<0.03	<0.03	<0.03
Dieldrin	µg/l	0.030	<0.03	<0.03	<0.03
Heptachlor	µg/l	0.030	<0.03	<0.03	<0.03
Heptachlor epoxide	µg/l	0.030	<0.03	<0.03	<0.03
Other pesticides	µg/l	0.10	See note 1	See note 1	See note 1
Pesticides total	µg/l	0.10	See note 1	See note 1	See note 1
Polycyclic aromatic hydrocarbons	µg/l	0.50	<0.16	<0.16	<0.16
Selenium	µg/l	0.10	<0.6	<0.6	<0.6
Tetrachloroeth-ene	µg/l	10	<3.0	<3.0	<3.0
Trichloroethene	µg/l	10	<3.0	<3.0	<3.0
Trihalomethan-es: Total	µg/l	100	<12	<12	<12
Vinyl Chloride	µg/l	0.50	<3.0	<0.113	<0.113
Part II: National requirements - prescribed concentrations/values					
Aluminium	µg/l	200	2.1	2.5	3.2

Parameter	Unit of measurement	Maximum concentration /value*	BH1 - P1 24/09/24 15:40	BH1 - P2 25/09/24 08:00	BH1 - P3 25/09/24 15:00
Colour	mg/l Pt/Co	20	37	28	16
Iron	µg/l	200	10	4	1.1
Manganese	µg/l	50	29	24	27
Odour	Acceptable to consumers and no abnormal change		No odour	No odour	No odour
Sodium	mg/l		14	15	15
Taste	Acceptable to consumers and no abnormal change		Untreated groundwater sample – not suitable for taste testing		
Tetrachlorome-thane (Carbon tetrachloride)	µg/l	3	<3.0	<3.0	<3.0
Turbidity	NTU (see Note 2)	4	11	3.4	2.4

Note 1 – See full pesticide analysis in Appendix F. All concentrations <0.03 to <0.10µg/l

Note 2 - NTU = Nephelometric Turbidity Unit

**as per The Private Supplies (England) Regulations 2016*

Table C

Prescribed concentrations, values or states

Parameter	Unit of measurement	Maximum concentration /value/state*	BH1 - P1 24/09/24 15:40	BH1 - P2 25/09/24 08:00	BH1 - P3 25/09/24 15:00
Ammoniacal Nitrogen (NH_4^+)	mg/l	0.50	0.019	0.049	0.046
Chloride	mg/l	250	26	28	26
Clostridium Perfringens	cfu/100ml	0	0	0	0
Coliform bacteria	cfu/100ml	0 / no abnormal change	8	2	2
Conductivity	µS/cm	2500	540	540	550
Hydrogen ion	pH	6.5 - 9.5	7.6	7.5	7.4
Sulphate	mg/l	250	37.5	36.9	34.3

Parameter	Unit of measurement	Maximum concentration /value/state*	BH1 - P1 24/09/24 15:40	BH1 - P2 25/09/24 08:00	BH1 - P3 25/09/24 15:00
Total organic carbon	mgC/l	No abnormal change	1.11	0.88	0.66
Turbidity	NTU	1	11	3.4	2.4

**as per The Private Supplies (England) Regulations 2016*

The majority of the parameters outlined above are below the maximum concentrations or values or state provided by The Private Supplies Regulations and/or are below laboratory Limit of Detection. However, two parameters, coliform bacteria and enterococci are noted to be above the maximum concentration/value. This is shown in Table 6.2.

Table 6.2: Exceedances in the prescribed concentrations or values

Parameter	Unit	Maximum concentration/value/ state	No of exceedances	Recorded concentration/value range
Enterococci	cfu/100ml	0 / no abnormal change	1	6
Coliform bacteria	cfu/100ml	0 / no abnormal change	3	2 - 8

Enterococci noted to exceed at a value of 6cfu/100ml in the first sample (P1). Coliform bacteria noted to exceed in all three samples with values of 8cfu/100ml (P1) and 2cfu/100ml (P2 and P3), i.e. showing a reduction with time.

The presence of coliforms and enterococci in the untreated groundwater means that disinfection (such as by chlorination or UV filtration) will be required as part of the water treatment for the water supply, which is standard practice. Further sampling analysis of the water supply prior to consumption will be required to confirm the treatment is working.

Whilst the water appeared clear with no visual turbidity, laboratory measured turbidity levels exceeded the water quality regulation threshold value of 1 NTU[9] It is noted that the laboratory measured turbidity decreased progressively between the first and final sample, from P1 (11 NTU) to P3 (2.4 NTU), and may continue to improve with longer duration pumping. However, it is likely that a filter to reduce turbidity to a level that complies with the Private Water Supplies (England) Regulations 2016 will be required as part of the water treatment.

[9] Nephelometric Turbidity Units

7. Conclusion

There is concern that large groundwater abstractions from the Folkstone Formation within the Hardham Basin exceed the sustainable limit for the aquifer which is potentially impacting on the designated sites within the Arun Valley (SAC, SPA, SSSIs and Ramsar site). Consequently, there are restrictions on abstractions from the Folkstone Formation aquifer requiring new developments within the area, such as the housing proposed at the Thakeham Tiles site, to meet water neutrality requirements to reduce pressure on the aquifer. Thakeham Tiles propose to abstract from the Hythe Formation underlying the site which is hydraulically separated from the Folkstone Formation by the low permeability aquitard of the Fittleworth Member of the Sandgate Formation.

Thakeham Tiles therefore commissioned the drilling of a borehole (BH1) through the Fittleworth Member and into the Hythe Formation and installed with a 126mm internal diameter well liner. Pumping tests and water quality sampling was undertaken to assess the suitability of the Hythe Formation to supply the proposed development with drinking water.

The aquifer testing demonstrates that the borehole is likely to produce the required yields for the proposed development abstraction rate not exceeding 84m^3/day and should be able to be sustained in the long term.

All chemical parameters within untreated groundwater collected from BH1 are below the maximum concentration/value and/or below the limit of detection. However, two biological parameters were in exceedance (total coliforms and enterococci). Turbidity was above the allowable limit on all three samples collected, however the turbidity reduced with longer pumping time.

The presence of coliforms and enterococci in the untreated groundwater means that disinfection (such as by chlorination or UV filtration) will be required as part of the water treatment for the water supply, which is standard practice. Filtration is likely to be required to reduce turbidity below the Private Water Supplies (England) Regulations 2016 threshold. Further sampling analysis of the water supply prior to consumption will be required to confirm the treatment is working.

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Appendix A Drawings

KEY PLAN

Borehole

NOTES

1. Contains OS data © Crown copyright and database right (2021)

REVISIONS

REV.	DRAWN BY INITIALS	CHECKED BY INITIALS	DATE	REVISION NOTES/COMMENTS
P01	LC	AJ	05/12/23	First Issue
P02	LC	AJ	17/06/24	Second Issue

Hydrock

CLIENT
Thakeham Tiles Ltd

PROJECT
Thakeham Tiles, Rock Road

TITLE
Abstraction Well Locations

HYDROCK PROJECT	SCALE @ A3
08347	1:1,500

PURPOSE OF ISSUE	STATUS
SUITABLE FOR INFORMATION	S2

DRAWING NO.	REVISIC
08347-HYD-XX-XX-DR-GE-1011	P02

Appendix B Ground Investigation Consent

Consent No:	S/2024/341

CONSENT TO INVESTIGATE A GROUNDWATER SOURCE

Section 32(3) Water Resources Act 1991

This **CONSENT** is issued by the Environment Agency ("the Agency") to:

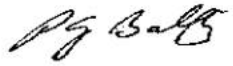
Hydrock Consultants Ltd ("the Consent Holder") on behalf of Thakeham Concrete Products Ltd

This Consent authorises the Consent Holder to construct two boreholes and abstract water for testing purposes from those boreholes at Thakeham Tiles, Rock Road, Storrington, Pulborough RH20 3AD.

National Grid References:
BH1: TQ 10353 15060
BH2: TQ 10348 15060

subject to the conditions set out in the Schedules 1 and 2 to this Consent.

This Consent is effective from the date below and expires on 31st March 2025

Signature 	Print name **Paul Batty**
Position **Team Leader, Groundwater Hydrology & Contaminated Land**	Date **3rd September 2024**

This Consent is issued by the Environment Agency, Solent & South Downs Area from its Chichester office Oving Rd, Portfield, Chichester PO20 2AG. The person whom the Consent Holder should contact during the carrying out of the works and if they have any queries is Richard Tucker (mobile: 07442 798604).

SCHEDULE 1 - General Conditions

1 INTERPRETATION

a) "The Consent Holder" means the person (whether an individual or organisation) to whom this consent is granted. Where the Consent Holder is two or more persons (e.g. a partnership) such persons shall be jointly and severally liable for the proper fulfilment of the conditions of this consent. In this consent the expression may also include, where the context so admits, a person who is the applicant for a consent i.e. before a consent is granted.

b) "The works" means the activities authorised or required by this consent, including the survey, construction of the well, borehole, well points, catchpit, or other work, and/or test pumping of the same, as the context so requires. The expression "the works" does not include activities for which this consent is unnecessary, such as construction of ancillary buildings, access roads, pits for drill cuttings, etc.

2 CLEARANCE/DEVELOPMENT PUMPING

Clearance/development pumping to remove any products of the well drilling or well development treatment is permitted under this Consent for a period not exceeding 48 hours. Clearance/development pumping that extends beyond 48 hours must be agreed with the Agency prior to the commencement of pumping. There must be a **full recovery** of water levels before a proper test pumping commences. Condition 5 of Schedule 1 of this Consent concerning the discharge of water and potential for pollution/physical disturbance applies to any such pumping operations.

3 SURVEY

The works shall not proceed unless and until the Agency has informed the Consent Holder in writing to the effect that (i) it considers the survey of water sources and other features which may be relevant to the works as specified by the Agency has been carried out adequately and (ii) it appears unlikely that test pumping will significantly affect other water users.

4 NOTICES etc TO THE AGENCY

Unless other periods are agreed in writing with the Agency, the Consent Holder shall give written notice to the Agency as follows:-

a) 5 days' notice before first commencing construction of the works

b) 5 days' notice before commencing acidisation or other treatment of the works

c) 10 days' notice before commencing test pumping.

Notice, and other information required by the Agency, shall be sent to the office at the address shown on the front of this consent for the attention of the person named there.

5 DISCHARGE OF WATER and POTENTIAL FOR POLLUTION/ PHYSICAL DISTURBANCE

a) The Consent Holder shall construct and finish the works so that water is prevented from running to waste. Any artesian flow must be securely capped.

b) The Consent Holder shall secure any completed works so as to prevent pollution or other hazard through those works, for example by capping and locking a completed borehole.

c) The Consent Holder shall ensure that pollution of, interference with, or damage to inland freshwaters or groundwater does not occur, whether from abstracted water or from substances or materials used in connection with the works.

d) The Consent Holder shall be responsible for obtaining necessary consents in relation to structures in, over or under watercourses.

e) The Consent Holder shall be responsible for the proper disposal of wastes from the works.

f) The Consent Holder shall notify neighbouring landowners who may be affected by discharge from the works and, if applicable, the Internal Drainage Board for the area, and shall take all necessary steps to prevent flooding.

g) The Consent Holder shall ensure that all persons engaged in the works are free from, and are not carriers of, waterborne diseases, and shall ensure that they operate to a high standard of hygiene.

6 EFFECTS ON OTHER WATER SOURCES

The Consent Holder shall immediately inform the Agency if any information or complaint is received by him about the consented operation and shall immediately consult with the Agency as to the appropriate action to be taken.

7 RECORDS

The Consent Holder shall keep such records of strata encountered, construction of the works, results of any geophysical logging, water quality analyses, and test pumping data as may be required by the Agency. The information shall be given on forms provided by the Agency, and/or on compatible computer disk in a format agreed with the Agency. These records must be returned within one month of completion of the works or with any subsequent licence application (whichever is sooner).

8 PRESENTATION OF RESULTS

The Consent Holder shall present results and analysis of test pumping in the form specified in Schedule 2 to this consent.

9 INFORMATION TO THE BRITISH GEOLOGICAL SURVEY (BGS) ON BEHALF OF THE NATURAL ENVIRONMENT RESEARCH COUNCIL

a) Where the proposed works are intended to be more than 15 metres (50 feet) deep, the Consent Holder must notify BGS before starting the works. BGS' address for the purpose is the Hydrogeology Group, British Geological Survey, Maclean Building, Crowmarsh Gifford, Wallingford, Oxon OX10 8BB.

b) The Consent Holder shall send BGS stratigraphic and test pumping information as required by section 198 Water Resources Act 1991

within one month of completing the work. By arrangement with BGS, the Agency will do this on behalf of the Consent Holder unless the Consent Holder instructs otherwise.

c) Under "The Borehole Sites and Operations Regulations 1995" HSE must be notified when drilling boreholes more than 30 metres deep into used or disused mining areas. The regulations define "mining area" as land within one kilometre in a horizontal or other direction of workings in a mine, or where a licence to mine for minerals has been granted.

10 DRILLING SAMPLES

Samples shall be taken whenever there is a change in stratum, or at 10 metre intervals, whichever is less. The samples shall be bagged or boxed and labelled with their location, depth below ground level, and date taken. The samples shall be kept available for inspection by the Agency for up to 30 days following completion of the works.

11 MEASUREMENT ACCESS

The Consent Holder shall provide an access tube of diameter adequate for measuring instruments to be lowered safely into the borehole. In the case of lagoons, the consent holder shall install a gauge board, of a design approved by the Agency, in a position in the lagoon so that at all times the full range of water levels from normal top water level to the maximum drawdown level can be safely observed. The datum level on the gauge board shall be accordingly levelled to Ordnance Datum (Newlyn).

12 ENTRY BY THE AGENCY or BGS

The Consent Holder shall allow representatives of the Agency or BGS to enter the site at all reasonable hours, to inspect the works, to inspect and take copies or extracts of documents, and to take measurements and samples, as such representatives consider appropriate.

13 STANDARDS OF WORK

Unless otherwise specified in this consent or subsequently agreed with the Agency, the Consent Holder shall carry out the works and present data fully in accordance with British Standard ISO 14686 (2003) "Hydrometric determinations – pumping tests for water wells – considerations and guidelines for design, performance and use". Copies of this are available from BSI, 389 Chiswick High Road, London, W4 4AL. Tel: (020) 89969000. http://www.bsi-global.com/. The Agency may require repetition of tests or other appropriate remedial activities should the required standards not be met.

SCHEDULE 2 - Special Conditions

1. CONSTRUCTION DETAILS

When constructing the works:

a. The boreholes shall be constructed in accordance with the designs as supplied by the consent holder. Drawing ref: "08347 Preliminary borehole design P02"

b. The maximum depth of the boreholes shall be 65m.

c. The boreholes shall be constructed to target the Hythe Formation only.

d. The maximum diameter of the boreholes shall be no greater than 250mm.

e. The boreholes outer casing shall be of steel construction to a depth of 5m bgl.

f. The maximum diameter of the borehole liner shall be no greater than 175mm

g. The well lining shall be constructed of solid PVC liner from the head works to a minimum depth of 1m below the base of the Fittleworth Member, followed by slotted PVC screen to 1m above the base of the Hythe Formation or a maximum depth of 64m bgl , followed by 1m of solid PVC liner to the base of the borehole.

h. The boreholes shall be grouted from ground level to a depth of 20m bgl.

i. Bentonite seals and raised wellheads and covers will be installed to prevent groundwater contamination.

j. A dip tube shall be positioned in the boreholes so that a cable dipper can be lowered to record the water level without fouling installed pumping equipment. The dip tube shall be at least 25mm in diameter and shall at all times extend to a depth not less than 1 meter below the minimum water level as recorded when the borehole is operating at the proposed maximum hourly rate of abstraction.

k. There should be suitable pollution prevention measures in place at the site during construction & development to prevent any sediment or polluting material entering any nearby watercourses or the groundwater.

l. If contaminated material or groundwater is found at any time during the works, the Consent Holder is required to immediately stop construction and contact the Environment Agency.

2. PROGRAMME

The Consent Holder shall carry out chemical testing of the soils within the borehole starter pits to ensure there is no contamination present, prior to the construction of the boreholes.

The Consent Holder shall carry out chemical testing of the groundwater within the boreholes to ensure there is no contamination present, prior to the test pumping of the boreholes.

The Consent Holder shall carry out test pumping and measurement of water levels in the works and at other points using a preliminary step test and constant rate test. Full Details of your test requirements are given in section 5.

Pumping rates shall not exceed a maximum of $6m^3/hr$ during the step tests and $3.5m^3/hr$ during the constant rate tests.

3. CHEMICAL TESTING

Prior to construction of the boreholes to ensure there is no contamination present, the Consent Holder shall undertake chemical testing of the soils within the borehole starter pits as detailed in document: "08417 Thakeham Tiles abstraction well testing suite.xlxs".

The Consent Holder shall undertake chemical testing of the groundwater in each borehole as detailed in document: "08417 Thakeham Tiles abstraction well testing suite.xlxs" to ensure there is no contamination present prior to discharging any abstracted waters to ground.

4. WATER LEVEL MONITORING

2a. At the pumped source

The Consent Holder shall measure and record water levels daily for 3 days before any pumping commences. Thereafter the Consent Holder shall measure water levels as shown on the attached data sheets (WR39) from the commencement and completion of the constant rate test, and afterwards during the recovery test. Discharge rates or meter readings must be recorded at the minimum frequency during pumping.

Where data logger is to be used to measure water levels, the Consent Holder shall ensure loggers/pressure transducers are accurately levelled into borehole datum. Any transducers installed must be capable of resolving fluctuations in pressure equivalent to 0.02 meters of water or less. Data should be recorded at 5-minute intervals or less using a data logger.

In addition to data logging, manual groundwater level measurements should be undertaken within the borehole on test for the first 3 hours of the test and recovery at the intervals detailed on the WR39 test pumping form.

Prior to cessation of testing The Consent Holder shall:

a. verify the groundwater level in the test borehole has reached steady state. If the groundwater level has not reached steady state, the Consent Holder must contact the Environment Agency to discuss if the test needs to be extended.
b. verify the data from the data loggers are valid. If the data is invalid the Consent Holder must contact the Environment Agency to discuss if the test needs to be repeated.

2b. Observation points

In addition to groundwater monitoring in the borehole being tested, the Consent Holder is required to monitor the following:

a. The well at Orchardway Farm NGR: TQ 10383 15215

The Consent Holder shall measure and record water levels/flows daily in the observation points for 3 days before the test pumping of the production borehole. Thereafter the Consent Holder shall measure water levels as shown on the attached data sheets (WR39) from the commencement and completion of the constant rate test, and afterwards during the recovery test.

Where continuous monitoring of any observation site has been specified, the Consent Holder shall arrange for water levels to be measured at the observation site(s) by pressure transducers accurately leveled into borehole datum. Any transducers installed must be capable of resolving fluctuations in pressure equivalent to 0.02 metres of water or less. Data should be recorded at 5-minute intervals or less using a data logger.

Prior to cessation of testing The Consent Holder will verify the data from the data logger is valid. If the data is invalid the Consent Holder must contact the Environment Agency to discuss if the test needs to be repeated.

5. TEST PUMPING

A meter shall be fitted to the borehole pump during abstraction to monitor the abstraction rate. Meter readings must be recorded initially every hour for the first 4 hours, and then as frequently as practicable.

No pumping tests shall commence until the Consent Holder has verified the groundwater levels have recovered fully from any previous pumping test.

Pumping tests will be undertaken in periods of low groundwater and must be agreed with the Environment Agency prior to testing.

Any proposed changes to the pump testing schedule must be discussed and agreed with the Environment Agency beforehand.

a. Preliminary Step Tests
Step testing will be undertaken on each borehole in isolation at the following rates and durations:

1st rate	$2m^3$	for	60 minutes
2nd rate	$3m^3$	for	60 minutes
3rd rate	$4m^3$	for	60 minutes
4th rate	$5m^3$	for	60 minutes
5th rate	$6m^3$	for	60 minutes

b. Constant Rate Testing
The Consent Holder shall pump the borehole for 24 hours at a constant rate of no greater than $3.5m^3$/hour. This is based on the assumption that the step tests showed that this rate is achievable.

If, during the Constant Rate Test, groundwater levels have not stabilised after pumping for 24 hours, the Consent Holder must contact the Environment Agency to discuss if the test needs to be extended.

Immediately after the Constant Rate Test the Consent Holder shall carry out a Recovery Test on the pumped borehole for 24 hours or until recovery is complete, whichever is the sooner.

6. DISCHARGE OF WATER

The Consent Holder shall:

a. Discharge all development pumping water to ground at an appropriate location as agreed with the Environment Agency.

b. All discharge points will be lined with a minimum of 5m x 5m of plastic sheeting to buffer and disperse the discharged water to prevent scouring and deterioration of ground conditions.

c. Discharge the water via a dewatering bag or other suitable filtering method to prevent sedimentation or contamination of the environment.

d. Ensure that the water discharged does not cause any localised flooding.

e. Undertake regular visual inspections of the discharge locations and drainage network will be undertaken to ensure the water levels are suitably managed and not at risk of causing localised flooding.

Any discharge must not cause localized flooding, turbidity, adverse effect on any water course/ environment.

The pumped water should be disposed of in such a way as to prevent re-circulation back to the aquifer

7. PROVISION OF INFORMATION

The Consent Holder shall present construction details and water level information on form WR-38 (Borehole Records) provided by the Environment Agency.

The Consent Holder shall ensure that a geologist is on-site during the construction of the boreholes to ensure the ground conditions encountered are suitably logged and sampled.

Logging and sampling will be undertaken during the construction of the boreholes and in accordance with suitable British Standards such as BS5930 and BS EN ISO 22475.

Where continuous monitoring of the test source and/or any observation sites has been specified, the Consent Holder shall submit monitoring data recovered from data loggers to the Agency Windows EXCEL format with hourly and summary data.

8. OTHER SPECIAL CONDITIONS

There should be suitable pollution prevention measures in place at the site during construction, to prevent any sediment or polluting material entering any nearby watercourses or the groundwater.

If contaminated material or groundwater is found at any time during the works, the Consent Holder is required to immediately stop construction and contact the Environment Agency.

Should there be a pollution incident you must inform the Environment Agency immediately on the Incident Hotline telephone number 0800 80 70 60.

Appendix C Soil Sampling Assessment report

Technical Note

Project name	Thakeham Tiles	Client	Thakeham Tiles Ltd
Design note title	Abstraction well soil sampling assessment		
Document reference	08347-HYD-XX-XX-TN-GE-1001		
Author	Lily Cherry		
Approver	Mark Griffiths		
Revision	P01		
Date	2 September 2024		

1. Introduction

As part of the development plans set out for the site known as Thakeham Tiles situated along Rock Road, Storrington, Pulborough, RH20 3AD, groundwater abstraction wells are required to supplement the water supply for the proposed new residential properties. The proposed abstraction well locations are presented in Appendix A, drawing ref: 08347-HYD-XX-XX-DR-GE-1011.

Thakeham Tiles (the client) are looking to drill a single borehole (BH1) to obtain initial information of the groundwater quality and feasibility of obtaining the water at the abstraction rate required for the new development. BH1 is located in an area which is proposed to be a maintenance area and will not be used for new housing.

2. Site visit summary

A consent to investigate a groundwater source (Consent no. S/2024/341), has been issued by the Environment Agency (EA). The conditions within the GIC stipulate contamination analysis of the soil within the starter handpit to be undertaken and assessed prior to the commencement of the borehole.

On the 27th August 2024, Hydrock undertook the handpit to a depth of 1.2 metres below ground level (m bgl). Ground conditions encountered are summarised below and shown on exploratory hole log within Appendix B. Photographs are also presented within Appendix B.

BH1 (HP)

- Ground level to 0.30m bgl: Cream slightly sandy gravels and cobbles of concrete and flint (Made Ground – concrete slab);
- 0.30m – 0.50m bl: Brown gravelly sand with cobbles of concrete, flint and brick (Made Ground – concrete slab subbase);
- 0.50m – 1.00m bgl: Very soft orange brown sandy clay (Fittleworth Member);
- 1.00m – 1.25m bgl: Soft grey mottled orange brown sandy clay (Fittleworth Member).

Three environmental samples were collected within the handpit, one within the Made Ground subbase at 0.35m bgl and two within the clays of the Fittleworth Member at 0.60m and 1.10m bgl.

No obstructions and no visual or olfactory evidence of contamination were noted within the handpit.

A slow water seepage was noted at the base.

3. Geo-environmental laboratory analyses

The chemical test certificates for the three samples collected above are provided in Appendix C. Wherever possible, UKAS and MCERTS accredited procedures have been used.

The geo-environmental analyses undertaken on the soil samples above included:

- Metals and metalloids (*Comprising: As, B (water soluble), Be, Cd, Cr (total), Cr (VI), Cu, Hg, Ni, Pb, S (elemental), Se, V, Zn, cyanide (total), sulfide, pH,*
- *Asbestos fibres,*
- *Speciated polynuclear aromatic hydrocarbons (PAH, by GC-FID), total phenols and fraction of organic carbon); and* speciated aliphatic and aromatic banding total petroleum hydrocarbons.

4. Conceptual site model

In line with the LCRM[1], a conceptual site model (CSM) has been developed for the area of BH1 to understand the risks to receptors in that area. A risk only needs further assessment if a complete pollutant linkage exists. The purpose of the CSM to understand what remediation, if any, may be needed within the area of the proposed boreholes to determine whether or not the borehole may become disturbed in the future as a result of that activity. The possible pollutant linkages are summarised in Table 1.

Table 1: Conceptual site model

Source	Pathway	Receptor	Existing mitigation	Plausible pollutant linkage?
Made Ground	Ingestion, inhalation of soil/ soil dust	Future site user	The area of the borehole is proposed for a maintenance area and covered by hard surfacing and soft landscaping (not for housing). Consequently, exposure to soils will be negligible.	Possible risk to future maintenance workers
	Dermal contact with soil/ soil dust			
	Leaching and vertical flow through the unsaturated and saturated zone	Hythe Formation Principal aquifer	The site is underlain by the Fittleworth Member (sandstone and mudstone) of the Sandgate Formation. The mudstone units acting as an aquitard and minimising vertical transport of contaminants to the Hythe Formation below.	No
	Leaching and vertical flow along the borehole annulus		A permanent steel casing will be installed to 5m bgl providing a barrier for lateral migration to the borehole annulus. A cement/ bentonite seal will be installed below the steel casing to seal the annulus above the Hythe Formation.	No

[1] Environment Agency, 2023, Land Contamination Risk Management (LCRM) (https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm)

Based on the CSM, it is considered unlikely, but possible that a future receptor working within the maintenance areas may become exposed to Made Ground soils near to the boreholes. Therefore, further generic quantitative risk assessment (GQRA) has been undertaken.

5. Geo-environmental assessment

5.1 Human Health risk assessment

5.1.1 Generic Assessment Criteria

The soil screening values used are generic assessment criteria (GAC) (i.e. derived in accordance with EA CLEA guidance (2009) using the updated exposure model detailed in Defra SP1010 (2014), with the exception of published C4SLs. The term 'GAC' used in this report is inclusive of all generic soil screening values.

Based on the proposed development, generic assessment criteria (GAC) based on a default residential with homegrown produce, CLEA land use scenario have been adopted.

GAC are selected based on the following hierarchy:

» Category 4 Screening Levels (C4SL), where available.
» SoBRA Acute GAC for free cyanide, as acute dose toxicity is the primary risk driver.
» Hydrock GAC, derived by Hydrock as detailed in Appendix D.

5.1.2 Assessment results

The soil data assessment sheets are presented in Appendix C. Based on the data comparison against the GAC the results indicate that all chemicals of Potential Concern (CoPC) within the soils of the handpit are below the relevant GAC and therefore all relevant contaminant linkages are incomplete.

6. Conclusions

Shallow soils at the location of BH1 comprised a layer of Made Ground of concrete over a sub base. No visual and/or olfactory evidence of contamination was observed.

A risk assessment undertaken in line with LCRM has concluded that the risk to the Hythe Formation resulting from leaching of contaminants within the Made Ground will be negligible and to future site users in the maintenance area will be negligible.

It is therefore considered that remediation in the area of BH1, that may cause damage to the borehole, is unlikely.

Appendix A Drawing

KEY PLAN

Borehole

NOTES

1. Contains OS data © Crown copyright and database right (2021)

REVISIONS

REV.	DRAWN BY INITIALS	CHECKED BY INITIALS	DATE	REVISION NOTES/COMMENTS
P01	LC	AJ	05/12/23	First Issue
P02	LC	AJ	17/06/24	Second Issue

Hydrock

CLIENT
Thakeham Tiles Ltd

PROJECT
Thakeham Tiles, Rock Road

TITLE
Abstraction Well Locations

HYDROCK PROJECT	SCALE @ A3
08347	1:1,500

PURPOSE OF ISSUE	STATUS
SUITABLE FOR INFORMATION	S2

DRAWING NO.	REVISIC
08347-HYD-XX-XX-DR-GE-1011	P02

Appendix B Exploratory hole log and photographs

Hydrock now Stantec

Project: Thakeham Tiles

Trialpit No
BH1
Page No. 1 of 1

Method: Hand-dug Pit	Date(s): 27/08/2024	Logged By: LC	Checked By: MG
Client: Thakeham Tiles Ltd	Co-ords: 510353.00, 115060.00	Stability: Stable	Dimensions: 0.30m x 0.30m; Scale: 1:10
Hydrock Project No: 08347		Plant: Hand tools	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Cream slightly sandy subangular to angular fine to coarse GRAVELS AND COBBLES of concrete and flint. Sand is fine to coarse. (MADE GROUND).	0.30	(0.30)		
0.35	ES			Brown gravelly fine to coarse SAND with rare subangular cobbles of flint and brick. Gravel is subangular to angular fine to coarse of concrete, brick and flint. (MADE GROUND).	0.50	(0.20)		
0.60	ES			Very soft orange brown very sandy CLAY. Sand is fine to medium. (FITTLEWORTH MEMBER).	1.00	(0.50)		
1.10	ES			Soft grey mottled orange brown sandy CLAY. Sand is fine to medium. (FITTLEWORTH MEMBER).	1.25	(0.25)		
				Base of Excavation at 1.25m				

General Remarks:
1. Starter hand pit dug prior to drilling to collect environmental samples for testing. 2. Slow water seepage encountered at base of pit. 3. Backfilled with arisings

Logged in general accordance with BS5930:2015

Photograph 1	
Date: 27/08/2024	
Direction Photograph Taken: N/A	
Easting: 510353	
Northing: 115060	
Description: Location of BH1	

Photograph 2	
Date: 27/08/2024	
Direction Photograph Taken: South East	
Easting: 510353	
Northing: 115060	
Description: BH1 Handpit dug to 1.25m bgl	

Photograph 3	
Date: 27/08/2024	
Direction Photograph Taken: N/A	
Easting: 510353	
Northing: 115060	
Description: BH1 Handpit dug to 1.25m bgl. Water seepage noted at base.	

Photograph 4	
Date: 27/08/2024	
Direction Photograph Taken: N/A	
Easting: 510353	
Northing: 115060	
Description: Concrete slab arisings from ground level to 0.30m bgl.	

Photograph 5	
Date: 27/08/2024	
Direction Photograph Taken: N/A	
Easting: 510353	
Northing: 115060	
Description: Concrete slab subbase (Made Ground) arisings from 0.30m bgl to 0.50m bgl.	
Photograph 6	
Date: 27/08/2024	
Direction Photograph Taken: N/A	
Easting: 510353	
Northing: 115060	
Description: Clay arisings from 0.50m bgl to 1.0m bgl.	

Photograph 7	
Date: 27/08/2024	
Direction Photograph Taken: N/A	
Easting: 510353	
Northing: 115060	
Description: Clay arisings from 1.00m bgl to 1.25m bgl.	

Appendix C Geo-environmental results and assessment

Assessment of Chemicals of Potential Concern to Human Health

Risk parameter:	Default - Human Health - commercial (1%SOM)
Client:	Thakeham Tiles Ltd
Site:	Thekeham Tiles
Job no.:	08347
Lab. report no(s).:	24-038569-1

Data Filters

Zone	All
Strata	All
Depth Min (m bgl)	0.35
Depth Max (m bgl)	1.1
Dataset mean SOM%	0.28
Scenario SOM%	1

Hydrock

All values in mg/kg unless otherwise stated

CAS No / P Code	Chemical of Potential Concern	Units	LoD	No. Samples	Min. Value	Max. Value	Mean	Median	Standard Deviation	No. Samples >= GAC & > LoD	Soil Saturation Limit @1% SOM	GAC	GAC Source	Strata	Date	27/08/24	27/08/24	27/08/24
															Zone			
															Location	BH1 (HP)	BH1 (HP)	BH1 (HP)
															Depth (m bgl)	0.35	0.6	1.1
-	**Asbestos**																	
P1020	Asbestos Identified	text	Y/N	3	-	-	-	-	No. of detects:	0	-	-	-			N	N	N
P1889	Asbestos Screen Name	text		0	-	-	-	-	-		-		-					
P1885	Asbestos Quant. (Stage 2)	%	0.001	0					No. > LOD:		-		-					
P1935	Asbestos Quant. Total	%	0.001	0					No. > LOD:		-		-					
P1826	Asbestos Quant. (Stage 3)	%	0.001	0					No. > LOD:		-		-					
-	Asbestos Quant. Total (Stages 2+3)	%	0.001	0					No. > LOD:		-		-					
P1880	Asbestos Containing Material Types Detected (ACM)	text		0	-	-	-	-	-		-		-					
-	**Hydrock Default Suite - FOC / SOM / pH**										-							
P1085	FOC (dimensionless)	]	0.001	3	0.001	0.002	0.002	0.002	0.00		-	-	-			0.002	<0.001	0.0019
-	SOM (calculated)	%	0.1724	3	0.17	0.34	0.28	0.33	0.09		-	-	-			0.3448	0.1724	0.32756
P1334	pH (su)	pH Units	0.1	3	5.00	11.50	8.03	7.60	3.27		-	-	-			11.5	7.6	5
-	**Hydrock Default Suite - Metals & PAH**																	
7440-38-2	Arsenic	mg/kg	1	3	10.00	28.00	19.33	20.00	9.02	0	NR	640	C4SL - CL:AIRE 2014			10	20	28
7440-41-7	Beryllium	mg/kg	0.06	3	0.42	1.50	0.79	0.45	0.62	0	NR	12	Hydrock Derived			0.42	1.5	0.45
7440-42-8	Boron	mg/kg	0.2	3	0.60	1.20	0.83	0.70	0.32	0	NR	240000	Hydrock Derived			1.2	0.7	0.6
7440-43-9	Cadmium	mg/kg	0.2	3	0.20	0.20	0.20	0.20	0.00	0	NR	410	C4SL - CL:AIRE 2014			<0.2	<0.2	<0.2
16065-83-1	Chromium (III)	mg/kg	1	3	17.00	28.00	21.33	19.00	5.86	0	NR	8400	Hydrock Derived			19	28	17
18540-29-9	Chromium (VI)	mg/kg	1.8	3	1.80	1.80	1.80	1.80	0.00	0	NR	49	C4SL - CL:AIRE 2014			<1.8	<1.8	<1.8
7440-47-3	Chromium (Total)	mg/kg	1	3	18.00	29.00	22.00	19.00	6.08			-				19	29	18
7440-50-8	Copper	mg/kg	1	3	4.40	9.90	6.50	5.20	2.97	0	NR	68000	Hydrock Derived			9.9	4.4	5.2
7439-92-1	Lead	mg/kg	1	3	7.50	9.70	8.23	7.50	1.27	0	NR	2300	C4SL - CL:AIRE 2014			7.5	7.5	9.7
7439-97-6	Mercury, inorganic	mg/kg	0.3	3	0.30	0.30	0.30	0.30	0.00	0	NR	1100	Hydrock Derived			<0.3	<0.3	<0.3
7440-02-0	Nickel	mg/kg	1	3	3.90	7.20	5.13	4.30	1.80	0	NR	980	Hydrock Derived			7.2	3.9	4.3
7782-49-2	Selenium	mg/kg	1	3	1.00	1.00	1.00	1.00	0.00	0	NR	12000	Hydrock Derived			<1	<1	<1
7440-62-2	Vanadium	mg/kg	1	3	23.00	36.00	28.33	26.00	6.81	0	NR	9000	Hydrock Derived			26	36	23
7440-66-6	Zinc	mg/kg	1	3	12.00	31.00	19.33	15.00	10.21	0	NR	730000	Hydrock Derived			31	12	15
P1095	Cyanide (free)	mg/kg	1	3	1.00	1.00	1.00	1.00	0.00	0	NR	24	Acute Risk - SoBRA 2020			<1	<1	<1
P1186	Total Phenols (Monohydric)	mg/kg	1	3	1.00	1.00	1.00	1.00	0.00	0	24237	440	Hydrock Derived			<1	<1	<1
83-32-9	Acenaphthene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	57	110000	Hydrock Derived			<0.05	<0.05	<0.05
208-96-8	Acenaphthylene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	86	110000	Hydrock Derived			<0.05	<0.05	<0.05
120-12-7	Anthracene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	1.17	540000	Hydrock Derived			<0.05	<0.05	<0.05
56-55-3	Benz(a)anthracene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	1.71	170	Hydrock Derived			<0.05	<0.05	<0.05
50-32-8	Benzo(a)pyrene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	0.91	77	C4SL - CL:AIRE 2014			<0.05	<0.05	<0.05
205-99-2	Benzo(b)fluoranthene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	1.22	44	Hydrock Derived			<0.05	<0.05	<0.05
191-24-2	Benzo(ghi)perylene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	0.02	3900	Hydrock Derived			<0.05	<0.05	<0.05
207-08-9	Benzo(k)fluoranthene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	0.69	1200	Hydrock Derived			<0.05	<0.05	<0.05
218-01-9	Chrysene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	0.44	350	Hydrock Derived			<0.05	<0.05	<0.05
53-70-3	Dibenz(ah)anthracene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	0.004	3.5	Hydrock Derived			<0.05	<0.05	<0.05
206-44-0	F uoranthene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	19	23000	Hydrock Derived			<0.05	<0.05	<0.05
86-73-7	F uorene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	31	71000	Hydrock Derived			<0.05	<0.05	<0.05
193-39-5	Indeno(123cd)pyrene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	0.06	500	Hydrock Derived			<0.05	<0.05	<0.05
91-20-3	Naphthalene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	76	1800	Hydrock Derived			<0.05	<0.05	<0.05
85-01-8	Phenanthrene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	36	23000	Hydrock Derived			<0.05	<0.05	<0.05
129-00-0	Pyrene	mg/kg	0.05	3	0.05	0.05	0.05	0.05	0.00	0	2.2	54000	Hydrock Derived			<0.05	<0.05	<0.05
P1310	PAH 16 Total	mg/kg	0.8	3	0.80	0.80	0.80	0.80	0.00			-				<0.8	<0.8	<0.8
-	**TPH fractions**																	
P1407	TPH ali EC05-EC06	mg/kg	0.001	3	0.01	0.01	0.01	0.01	0.000	0	304	3200	Hydrock Derived			<0.01	<0.01	<0.01
P1408	TPH ali >EC06-EC08	mg/kg	0.001	3	0.01	0.01	0.01	0.01	0.000	0	144	7800	Hydrock Derived			<0.01	<0.01	<0.01
P1409	TPH ali >EC08-EC10	mg/kg	0.001	3	0.01	0.01	0.01	0.01	0.000	0	78	2000	Hydrock Derived			<0.01	<0.01	<0.01
P1410	TPH ali >EC10-EC12	mg/kg	1	3	1.00	1.00	1.00	1.00	0.00	0	48	9700	Hydrock Derived			<1	<1	<1
P1411	TPH ali >EC12-EC16	mg/kg	2	3	2.00	7.80	3.93	2.00	3.35	0	24	59000	Hydrock Derived			7.8	<2	<2
P1412	TPH ali >EC16-EC21	mg/kg	8	3	8.00	33.00	16.33	8.00	14.43			-				33	<8	<8
P1413	TPH ali >EC21-EC35	mg/kg	8	3	8.00	140.00	52.00	8.00	76.21			-				140	<8	<8
P1938	TPH ali >EC16-EC35	mg/kg	10	3	10.00	180.00	66.67	10.00	98.15	0	8	1600000	Hydrock Derived			180	<10	<10
P1415	TPH ali >EC35-EC44	mg/kg	8.4	3	8.40	48.00	21.60	8.40	22.86	0	8	1600000	Hydrock Derived			48	<8.4	<8.4
P1418	TPH ali >EC5-EC35	mg/kg	10	3	10.00	180.00	66.67	10.00	98.15			-				180	<10	<10
P1420	TPH ali >EC5-EC44	mg/kg	10	3	10.00	230.00	83.33	10.00	127.02			-				230	<10	<10
P1441	TPH aro EC05-EC07	mg/kg	0.001	3	0.01	0.01	0.01	0.01	0.00	0	1218	26000	Hydrock Derived			<0.01	<0.01	<0.01
P1355	TPH aro >EC07-EC08	mg/kg	0.001	3	0.01	0.01	0.01	0.01	0.00	0	869	56000	Hydrock Derived			<0.01	<0.01	<0.01
P1356	TPH aro >EC08-EC10	mg/kg	0.001	3	0.02	0.02	0.02	0.02	0.00	0	613	3500	Hydrock Derived			<0.02	<0.02	<0.02
P1357	TPH aro >EC10-EC12	mg/kg	1	3	1.00	1.00	1.00	1.00	0.00	0	364	16000	Hydrock Derived			<1	<1	<1
P1358	TPH aro >EC12-EC16	mg/kg	2	3	2.00	2.00	2.00	2.00	0.00	0	169	36000	Hydrock Derived			<2	<2	<2
P1359	TPH aro >EC16-EC21	mg/kg	10	3	10.00	10.00	10.00	10.00	0.00	0	54	28000	Hydrock Derived			<10	<10	<10
P1360	TPH aro >EC21-EC35	mg/kg	10	3	10.00	10.00	10.00	10.00	0.00	0	5	28000	Hydrock Derived			<10	<10	<10
P1362	TPH aro >EC35-EC44	mg/kg	8.4	3	8.40	8.40	8.40	8.40	0.00	0	5	28000	Hydrock Derived			<8.4	<8.4	<8.4
P1365	TPH aro >EC5-EC35	mg/kg	10	3	10.00	10.00	10.00	10.00	0.00			-				<10	<10	<10
P1941	TPH aro >EC5-EC44	mg/kg	10	3	10.00	10.00	10.00	10.00	0.00			-				<10	<10	<10
P1373	Total TPH >EC5-EC44	mg/kg	10	0														
-	**VOCs - BTEX & MTBE**																	
71-43-2	Benzene	mg/kg	1	3	0.01	0.01	0.01	0.01	0.00	0	1218	27	C4SL - CL:AIRE 2014			<0.005	<0.005	<0.005
108-88-3	Toluene	mg/kg	1	3	0.01	0.01	0.01	0.01	0.00	0	869	56000	Hydrock Derived			<0.005	<0.005	<0.005
100-41-4	Ethylbenzene	mg/kg	1	3	0.01	0.01	0.01	0.01	0.00	0	518	5700	Hydrock Derived			<0.005	<0.005	<0.005
95-47-6	Xylene, o-	mg/kg	1	3	0.01	0.01	0.01	0.01	0.00	0	478	6600	Hydrock Derived			<0.005	<0.005	<0.005
1330-20-7	Xylene, p- (or combined m & p)	mg/kg	1	3	0.01	0.01	0.01	0.01	0.00	0	576	5900	Hydrock Derived			<0.005	<0.005	<0.005
1634-04-4	MTBE	mg/kg	1	3	0.01	0.01	0.01	0.01	0.00	0	20358	7500	Hydrock Derived			<0.005	<0.005	<0.005
	TPH Additivity Check			**HAZARD QUOTIENTS FOR EACH FRACTION**														
															Aliphatics >EC5-EC6	0.000003125	0.000003125	0.000003125
															Aliphatics >EC6-EC8	1.28205E-06	1.28205E-06	1.28205E-06
														Considered additive	Aliphatics >EC8-EC10	0.000005	0.000005	0.000005
															Aliphatics >EC10-EC12	0.000103093	0.000103093	0.000103093
															Aliphatics >EC12-EC16	0.000132203	3.38983E-05	3.38983E-05
															Aliphatics >EC16-EC35	0.0001125	0.00000625	0.00000625
															Aliphatics >EC35-EC44	0.00003	0.00000525	0.00000525
															Aromatics EC5-EC7	3.84615E-07	3.84615E-07	3.84615E-07
															Aromatics >EC7-EC8	1.78571E-07	1.78571E-07	1.78571E-07
														Considered additive	Aromatics >EC8-EC10	5.71429E-06	5.71429E-06	5.71429E-06
															Aromatics >EC10-EC12	0.0000625	0.0000625	0.0000625
															Aromatics >EC12-EC16	5.55556E-05	5.55556E-05	5.55556E-05
														Considered additive	Aromatics >EC16-EC21	0.000357143	0.000357143	0.000357143
															Aromatics >EC21-EC35	0.000357143	0.000357143	0.000357143
															Aromatics >EC35-EC44	0.0003	0.0003	0.0003
														Hazard Index table - HI or HQ greater than 1 highlighted with orange shading.	**Hazard Index for ali>C8-C16**	**0.000240296**	**0.000141991**	**0.000141991**
															Hazard Index for aro>C8-C16	0.00012377	0.00012377	0.00012377
															Hazard Index for aro>C16-C35	**0.000714286**	**0.000714286**	**0.000714286**

Legend:

MG	Made Ground
FW	Fittleworth Member

<0.02	Value below the laboratory reporting limit and are considered as being at the detection limit for the purposes of statistical analysis, as a conservative estimate.
0.02	Value greater than, or equal to, the generic assessment criterion (GAC).
64.00	Value exceed saturation limit and substance is liquid or solid at ambient temperature
*<20	Value excluded from statistical analysis
Y	Text result
-	Represents a determinand that was not tested.
+	represents a data point that is not included in the current filter settings

Template Version:
109: 11/03/24

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Analytical Report Number : 24-038569

Project / Site name:	Thakeham Tiles	**Samples received on:**	27/08/2024
Your job number:	08347	**Samples instructed on/ Analysis started on:**	27/08/2024
Your order number:	PO36149	**Analysis completed by:**	02/09/2024
Report Issue Number:	1	**Report issued on:**	02/09/2024
Samples Analysed:	3 soil samples		

Signed: [redacted]

Adan Cazas Garcia
Key Account Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-038569
Project / Site name: Thakeham Tiles
Your Order No: PO36149

Lab Sample Number				298430	298431	298432
Sample Reference				BH1	BH1	BH1
Sample Number				(HP)	(HP)	(HP)
Depth (m)				0.35	0.60	1.10
Date Sampled				27/08/2024	27/08/2024	27/08/2024
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**			
Stone Content	%	0.1	NONE	32.6	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9.1	20	23
Total mass of sample received	kg	0.1	NONE	1.5	1.4	1.2
Asbestos						
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	DSO	DSO	DSO
General Inorganics						
pH (L099)	pH Units	N/A	MCERTS	11.5	7.6	5
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	330	34	66
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.163	0.017	0.0328
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	163	17	32.8
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	0.002	< 0.0010	0.0019
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	< 0.80	< 0.80

Analytical Report Number: 24-038569
Project / Site name: Thakeham Tiles
Your Order No: PO36149

Lab Sample Number				298430	298431	298432
Sample Reference				BH1	BH1	BH1
Sample Number				(HP)	(HP)	(HP)
Depth (m)				0.35	0.60	1.10
Date Sampled				27/08/2024	27/08/2024	27/08/2024
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	10	20	28
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.42	1.5	0.45
Boron (water soluble)	mg/kg	0.2	MCERTS	1.2	0.7	0.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (III)	mg/kg	1	NONE	19	28	17
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	19	29	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	9.9	4.4	5.2
Lead (aqua regia extractable)	mg/kg	1	MCERTS	7.5	7.5	9.7
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	7.2	3.9	4.3
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	26	36	23
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	31	12	15
Petroleum Hydrocarbons						
TPHCWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	7.8	< 2.0	< 2.0
TPHCWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	33	< 8.0	< 8.0
TPHCWG - Aliphatic >EC16 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	10	MCERTS	180	< 10	< 10
TPHCWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	140	< 8.0	< 8.0
TPHCWG - Aliphatic >EC35 - EC44 $_{EH\_CU\_1D\_AL}$	mg/kg	8.4	NONE	48	< 8.4	< 8.4
TPHCWG - Aliphatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	180	< 10	< 10
TPHCWG - Aliphatic >EC5 - EC44 $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	230	< 10	< 10
TPHCWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.02	MCERTS	< 0.020	< 0.020	< 0.020
TPHCWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPHCWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10
TPHCWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10
TPHCWG - Aromatic >EC35 - EC44 $_{EH\_CU\_1D\_AR}$	mg/kg	8.4	NONE	< 8.4	< 8.4	< 8.4
TPHCWG - Aromatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	< 10	< 10	< 10
TPHCWG - Aromatic >EC5 - EC44 $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	< 10	< 10	< 10
TPH Total >EC5 - EC44 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	230	< 10	< 10
VOCs						
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 24-038569
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* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
298430	BH1	(HP)	0.35	Brown sand with gravel and stones
298431	BH1	(HP)	0.6	Brown clay and sand with gravel
298432	BH1	(HP)	1.1	Brown clay

Analytical Report Number : 24-038569
Project / Site name: Thakeham Tiles

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
TPH Chromatogram in soil	TPH Chromatogram in soil	In-house method	L064B	D	NONE
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS
Chromium III in soil	In-house method by calculation from total Cr and Cr VI	In-house method by calculation	L080	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080	W	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS

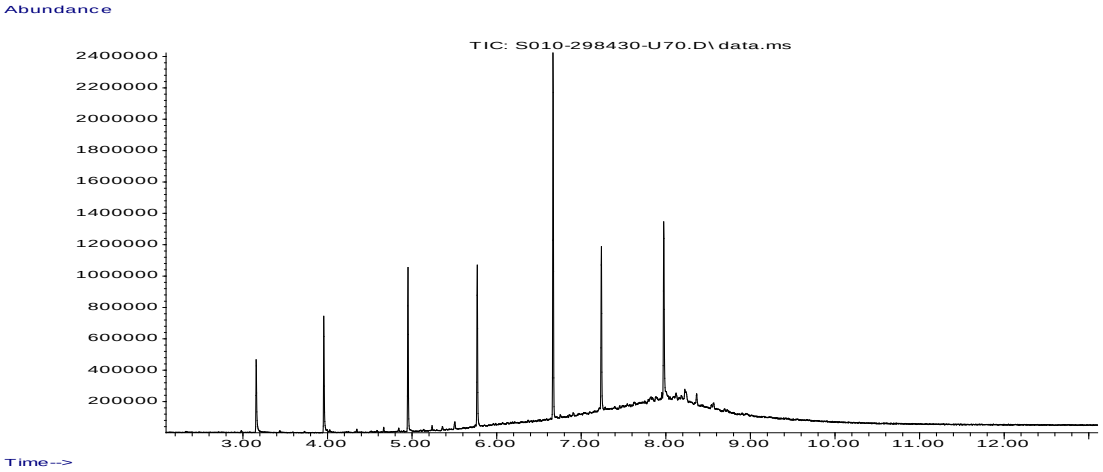
Analytical Report Number : 24-038569
Project / Site name: Thakeham Tiles

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS
Fraction Organic Carbon FOC Automated	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate	In-house method	L009B	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution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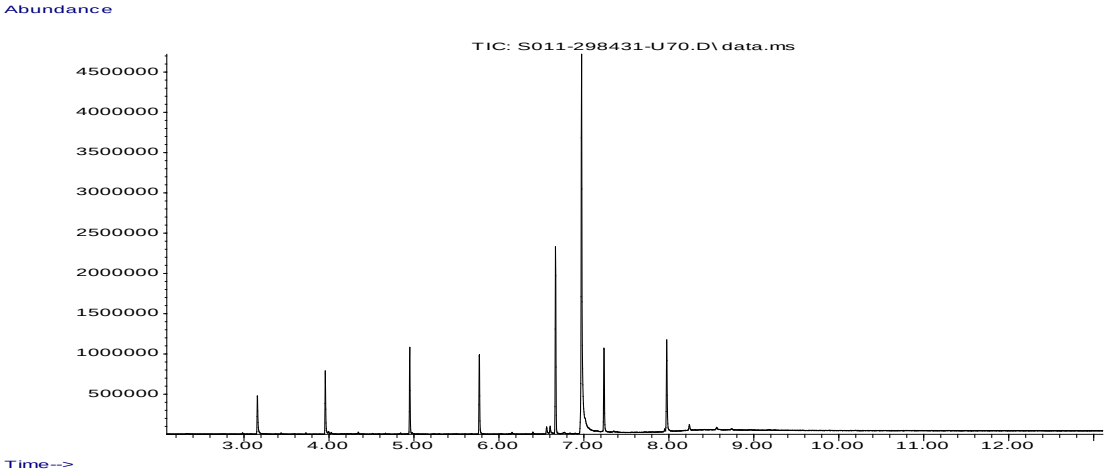
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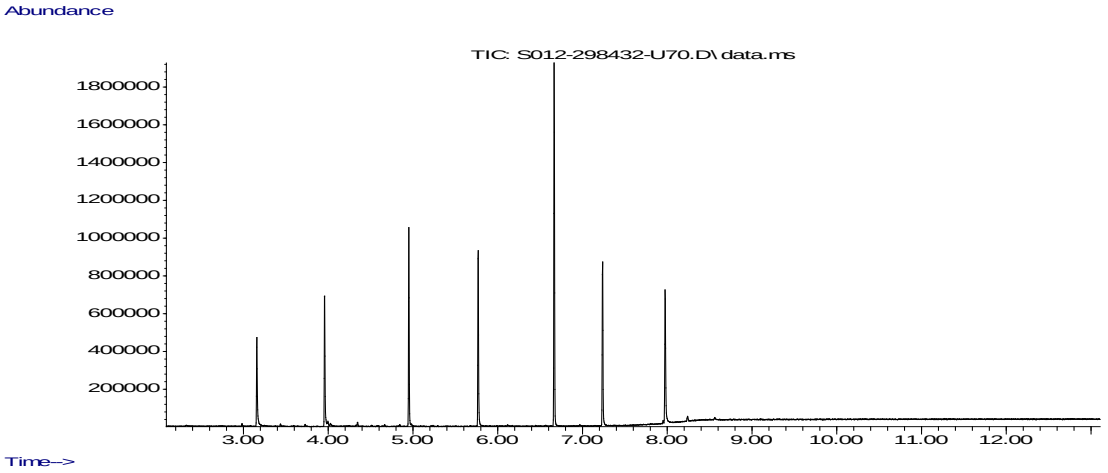
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Appendix D Hydrock GAC

GAC derivation

Background

Initially, the Hydrock GAC were derived following the publishing of soil guideline values (SGV), toxicological (TOX) reports and associated publications by the Environment Agency (EA) in 2009 referenced under Science Report SC050021 (EA, 2009a, b, c, d). The Hydrock GAC have then been periodically updated following publication of new information on toxicological, physico-chemical, land use or receptor parameters, namely:

- LQM/CIEH, 2009. LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment, second edition. Nathanial, C. P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillet, A. G., Ogden, R. C. and Scott, D.
- CL:AIRE, 2010. 'The EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment'. Environmental Industries Commission, The Association of Geotechnical and Geoenvironmental Specialists and Contaminated Land: Applications in Real Environment.
- CL:AIRE, 2014. 'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination', Revision 2, DEFRA research project SP1010. Contaminated Land: Applications in Real Environment.
- LQM/CIEH, 2015. 'The LQM/CIEH S4ULs for Human Health Risk Assessment'. Nathanial, C. P., McCaffrey, C., Gillet, A. G., Ogden, R. C. and Nathanial, J. F.
- CL:AIRE, 2021. 'C4SL Phase 2 Technical Reports'. Contaminated Land: Applications in Real Environment.

Land use scenarios

Hydrock has derived generic assessment criteria (GAC) for human health based on the six exposure scenarios defined in CL:AIRE (2014) using generic default assumptions from published guidance. GAC for each exposure scenario have been derived for three soil organic matter (SOM) contents, 1%, 2.5% and 6%.

All GAC have been rounded to two significant figures.

Exposure parameters

The exposure parameters used for the Hydrock GAC are the default parameters stated in SR3, unless updated in CL:AIRE (2014) where the CL:AIRE (2014) values have been adopted.

Approach to consumption rates

Hydrock have adopted the 90th percentile consumption rates from Table 3.4 of CL:AIRE (2014) for all produce types. This is noted to be more conservative than the "top two" approach taken in the derivation of C4SLs.

Approach to plant uptake for GAC omitted in CL:AIRE (2010)

Plant uptake factors were not identified in CL:AIRE (2010) for antimony, barium and molybdenum. Hydrock has sourced the required parameter values from ORNL (1984) in order to derive GAC that are inclusive of the homegrown produce exposure pathway.

Chemical and toxicity parameters

The chemical and toxicity parameters have been adopted based on the following documents:

- IRIS, 2016. 'Toxicological Review of Trimethylbenzenes'. Integrated Risk Information System, National Centre for Environmental Assessment, office of Research and Development, U.S. Environmental Protection Agency.

- LQM/CIEH, 2015.
- ORNL, 1984. 'ORNL-5786. A Review and Analysis of Parameters for Assessing Transport of Environmentally released Radionuclides through Agriculture'. Oak Ridge National Laboratory.
- CL:AIRE, 2010.
- RIVM, 2001. RIVM Report 711701 025 'HCV Re-evaluation of human-toxicological maximum-permissible risk levels'. National Institute of Public Health and the Environment.
- LQM/CIEH, 2009.
- EA, 2009a.

Approach to Cyanide GAC

The Hydrock GAC for free cyanide have been derived based on ingestion of a bolus of contaminated soil. The GAC are derived for acute exposure of a child (0-6 years old) for all land uses except commercial, where the GAC are derived for acute exposure of an adult (16-65 years old). For the purpose of GQRA, the child value may be adopted for all land use scenarios.

For complex cyanide, the GAC have been derived based on chronic exposure, using the default exposure scenarios but excluding the consumption of homegrown produce, soil attached to homegrown produce, indoor vapour and outdoor vapour pathways. The chronic health criteria value (HCV) for complex cyanide is based on the EA (2009a) HCV for free cyanide and the ratio of toxicity between free and complex cyanide proposed by RIVM (2001).

Approach to Phenol GAC

In accordance with the EA Science Report SC050021 / Phenol SGV, a $GAC_{ing/inh}$ has been derived for ingested and inhaled phenol using the CLEA model, with a GAC_{derm} derived for dermal contact using Equation 5.7 within SR3. The lower of the $GAC_{ing/inh}$ and GAC_{derm} has been adopted as the final GAC.

Approach to PCB GAC

GAC for assessing the non-dioxin-like risk from PCBs have been based on the "Dutch 7". As the TDI used by the authors of the Dutch guidance is for the sum of the 7 individual congeners, the TDI has been divided by 7 to create a TDI for each congener. The non-dioxin-like risk from PCBs is therefore assessed using a Hazard Index approach as for total petroleum hydrocarbons (TPH).

Sub-surface soil to indoor air correction factors

Reflecting the approach taken by the Environment Agency in the development of revised SGV in 2009 for BTEX, a sub-surface soil to indoor air correction factor of 10 has been applied for petroleum hydrocarbons in order to account for over-prediction of vapour intrusion into building using the Johnson and Ettinger approach.

The correction factor of 10 has been applied to the following petroleum hydrocarbons (it makes negligible difference to less volatile TPH and PAH compounds):

- TPHCWG fractions, namely aliphatic EC>5-44 and aromatic EC>6-44;
- PAHs (acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene), benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h,)anthracene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, pyrene);
- BTEX;
- Isopropylbenzene;

- Propylbenzene;
- 1,2,4- and 1,3,5-trimethylbenzene; and
- Styrene.

Approach to saturation limits

The CLEA model includes a traffic light colour system to highlight when saturated soil conditions have potentially been exceeded for the vapour pathways during calculation of assessment criteria. The colours represent:

- Green: the assessment criteria do not exceed the saturated soil concentration.
- Amber: the assessment criteria exceed the saturated soil concentration but the contribution of the indoor and outdoor vapour pathway to total exposure is less than 10% and will not significantly affect the assessment criteria.
- Red: the assessment criteria exceed the saturated soil concentration and the contribution of the indoor and outdoor vapour pathway to total exposure is greater than 10% and will significantly affect the assessment criteria.

Hydrock have not applied any further calculations or assessment in relation to saturation limits during GAC derivation, with the CLEA-modelled GAC being presented as the GAC. Consideration of saturation limits is undertaken during the data assessment stage.

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Appendix D Borehole Log

Hydrock now Stantec

Project: Thakeham Tiles

Borehole No
BH1
Page No. 1 of 3

Method: Hand-dug Pit	Date(s): 27/08/2024 - 13/09/2024	Logged By: LC	Drilled By: Marshall Drilling
Client: Thakeham Tiles Ltd	Co-ords: 510353.00, 115060.00	Checked By: MG	Flush: Air/Mist
Hydrock Project No: 08347	Ground Level: 50.59m OD		Scale: 1:100

Run (m)	Samples / Tests			Drilling Record			Water Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrumentation / Backfill
	Depth (m)	Type	Results	Weight (Kg)	Mins	Secs							
	0.35 0.60 1.10	ES ES ES						Cream slightly sandy subangular to angular fine to coarse GRAVELS AND COBBLES of concrete and flint. Sand is fine to coarse. (MADE GROUND).	0.30	(0.30)	50.29		
									0.50	(0.20)	50.09		
								Brown gravelly fine to coarse SAND with rare subangular cobbles of flint and brick. Gravel is subangular to angular fine to coarse of concrete, brick and flint. (MADE GROUND).	1.00	(0.50)	49.59		
									1.25	(0.25)	49.34		
								Very soft orange brown very sandy CLAY. Sand is fine to medium. (FITTLEWORTH MEMBER).					
								Soft grey mottled orange brown sandy CLAY. Sand is fine to medium. (FITTLEWORTH MEMBER).					
								Probably dark grey sandy CLAY with rare 2mm pockets of orange brown fine to coarse sand. Sand is fine and medium (FITTLEWORTH MEMBER).		(9.75)			
									11.00		39.59		
								Probably dark grey clayey fine to coarse SAND with fine and medium subangular gravels of glauconitic SANDSTONE (FITTLEWORTH MEMBER).		(16.00)			

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)
Comacq hio 602	09/09	1500	5.00	5.20	250		Air/Mist	Grey
	10/09	1000	5.00	6.20	203		Air/Mist	Grey
	10/09	1345	11.00	10.50	203		Air/Mist	Grey
	11/09	0800	19.80	19.50	203	14.40	Air/Mist	Grey
	11/09	1700	25.50	19.50	203	12.25	Air/Mist	Grey
	12/09	1730	58.00	19.50	203	14.20	Air/Mist	Grey. Noted green at 22m
	13/09	0715	56.50	19.50	203	14.20	Air/Mist	Grey
	13/09	1000	58.00	19.50	203	14.20	Air/Mist	

General Remarks:
1. Starter hand pit dug on 27/08/2024 prior to drilling to collect environmental samples for testing. 2. Slow water seepage encountered at base of pit. 3. Backfilled with arisings. 4. Rotary open hole drilling commencement on 09/09/2024, completed 13/09/2024. 5. Groundwater encountered at 19.80m bgl, rotary rods pulled out, after 20 minutes groundwater recorded at 12.25m bgl. 7. Final resting groundwater level recorded at 14.40m bgl. 7. Final borehole depth 58m bgl. 8. 126mm internal diameter UPVC pipe installed to 56.07m bgl (due to collapse of arisings at base of the borehole) - Response zone from 31.63m bgl to 55.07m bgl. 9. 1m plain sump pipe from 55.07m bgl to 56.07m bgl. 10. Ground level estimated based on nearby measurements.

Logged in general accordance with BS5930:2015

Hydrock now Stantec	Project: Thakeham Tiles	Borehole No BH1 Page No. 2 of 3	
Method: Hand-dug Pit	Date(s): 27/08/2024 - 13/09/2024	Logged By: LC	Drilled By: Marshall Drilling
Client: Thakeham Tiles Ltd	Co-ords: 510353.00, 115060.00	Checked By: MG	Flush: Air/Mist
Hydrock Project No: 08347	Ground Level: 50.59m OD		Scale: 1:100

Run (m)	Samples / Tests			Drilling Record			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrumentation / Backfill
	Depth (m)	Type	Results	Weight (Kg)	Mins	Secs							
								Probably dark grey clayey fine to coarse SAND with fine and medium subangular gravels of glauconitic SANDSTONE (FITTLEWORTH MEMBER).					
								... At 22.0m bgl drilling flush noted to become green in colour. Probable indication of nearing the base of the Fittleworth Member.					
								... Transition from Fittleworth Member to Hythe Formation inferred at approximately 27.0m bgl, due to drilling method.	27.00		23.59		
								Probably fine and medium glauconitic SANDSTONE recovered as dark grey sandy subangular fine and medium GRAVELS of glauconitic sandstone and occasional chert. Sand is coarse (HYTHE FORMATION).		(6.00)			
								Probably fine and medium glauconitic SANDSTONE. Recovered as dark grey sandy subangular fine and medium GRAVELS of glauconitic sandstone and occasional chert. Sand is coarse (HYTHE FORMATION).	33.00		17.59		

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)

General Remarks:
1. Starter hand pit dug on 27/08/2024 prior to drilling to collect environmental samples for testing. 2. Slow water seepage encountered at base of pit. 3. Backfilled with arisings. 4. Rotary open hole drilling commencement on 09/09/2024, completed 13/09/2024. 5. Groundwater encountered at 19.80m bgl, rotary rods pulled out, after 20 minutes groundwater recorded at 12.25m bgl. 7. Final resting groundwater level recorded at 14.40m bgl. 7. Final borehole depth 58m bgl. 8. 126mm internal diameter UPVC pipe installed to 56.07m bgl (due to collapse of arisings at base of the borehole) - Response zone from 31.63m bgl to 55.07m bgl. 9. 1m plain sump pipe from 55.07m bgl to 56.07m bgl. 10. Ground level estimated based on nearby measurements.

Logged in general accordance with BS5930:2015

Hydrock now Stantec

Project: Thakeham Tiles

Borehole No
BH1
Page No. 3 of 3

Method: Hand-dug Pit	Date(s): 27/08/2024 - 13/09/2024	Logged By: LC	Drilled By: Marshall Drilling
Client: Thakeham Tiles Ltd	Co-ords: 510353.00, 115060.00	Checked By: MG	Flush: Air/Mist
Hydrock Project No: 08347	Ground Level: 50.59m OD		Scale: 1:100

Run (m)	Samples / Tests			Drilling Record			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrumentation / Backfill
	Depth (m)	Type	Results	Weight (Kg)	Mins	Secs							
								Probably fine and medium glauconitic SANDSTONE. Recovered as dark grey sandy subangular fine and medium GRAVELS of glauconitic sandstone and occasional chert. Sand is coarse (HYTHE FORMATION).					
								... At 45.50m bgl loss of arisings were noted and change in pressure during drilling. Probable fracture. No recovery of samples.		(25.00)			
									58.00		-7.41		
								End of Borehole at 58.00m					

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)

General Remarks:
1. Starter hand pit dug on 27/08/2024 prior to drilling to collect environmental samples for testing. 2. Slow water seepage encountered at base of pit. 3. Backfilled with arisings. 4. Rotary open hole drilling commencement on 09/09/2024, completed 13/09/2024. 5. Groundwater encountered at 19.80m bgl, rotary rods pulled out, after 20 minutes groundwater recorded at 12.25m bgl. 7. Final resting groundwater level recorded at 14.40m bgl. 7. Final borehole depth 58m bgl. 8. 126mm internal diameter UPVC pipe installed to 56.07m bgl (due to collapse of arisings at base of the borehole) - Response zone from 31.63m bgl to 55.07m bgl. 9. 1m plain sump pipe from 55.07m bgl to 56.07m bgl. 10. Ground level estimated based on nearby measurements.

Logged in general accordance with BS5930:2015

Marshall Drilling Ltd on behalf of Hydrock — Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
			RO		0.50	5.00		0100		80	grey											0.00	Dry

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0945			
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1730	5.20	0.00	5.20

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer
C	250.00	0.00	5.20					10 inch			
RO	250.00	0.50	5.00				Drag Bit			Air/Mist	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
0945		CAT Scanned: Yes
0945		Permit Completed: Yes
0945	0030	Arrive on site, brief and walkover
1015	0130	Track rig to bh1, unload steelwork, set up rig, set up site
1145	0200	Water run, fuel run, lunch
1500	0200	Case to 5.20m with 10 inch casing
1700	0030	Secure site, leave

SPT I.D. Number	mdl07	Calibration Date	26/09/2024
SPT Rod Type	1 ½ Whitworth SPT	SPT Energy Ratio	.
Drilling Crew Details		CSCS No	
Support Operative	Liam Ferrari		
Lead Driller	Jake Skeet		
Site category	Green		
Project Engineer			
Lead Driller's signature			

Project Title

Thakeham Tiles

Weather	Fine	Project No	1000
Date	09/09/2024	Day	Monday
Rig type	Comacchio 602	Borehole Number	
Inclination		Orientation	bh1
Sheet	1 of 7	Completed	Y

AGS

Produced by KeyLogbook

Marshall Drilling Ltd on behalf of Hydrock — Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
			RO		5.20	6.20		0000		100	grey											5.20	0.50
			RO		6.20	11.00		0100		80	grey											6.20	5.90

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0800	5.20	0.00	5.20
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1700	11.00	0.00	10.50

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer
C	203.00	0.00	10.50					8 inch			
RO	155.00	5.20	11.00				PCD			Air/Mist	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
0800	0030	Arrive on site, plant checks, set up site
0830	0100	Mix grout in tubs. Mix ratio- 2 cement : 1 bentonite. Grout 10 inch casing in place
1000	0030	Case to 6.2m with 8 inch casing
1030	0030	Set up arisings system, pipe arisings into skip
1300	0030	Break
1345	0130	Ream 8 inch casing to 10.60m. Struggling to case to depth and keep mess to a reasonable level
1500	0100	Water run

SPT I.D. Number	mdl07	Calibration Date	26/09/2024
SPT Rod Type	1 ½ Whitworth SPT	SPT Energy Ratio	.
Drilling Crew Details		CSCS No	
Support Operative	Liam Ferrari		
Lead Driller	Jake Skeet		
Site category	Green		
Project Engineer			
Lead Driller's signature			

Project Title

Thakeham Tiles

Weather	Cloudy	Project No	1000
Date	10/09/2024	Day	Tuesday
Rig type	Comacchio 602	Borehole Number	
Inclination		Orientation	bh1
Sheet	2 of 7	Completed	Y

AGS

Produced by KeyLogbook

Marshall Drilling Ltd on behalf of Hydrock — Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0800	5.20	0.00	5.20
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1700	11.00	0.00	10.50

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
1600	0030	Finish casing to 10.50m
1630	0030	Secure site, leave

SPT I.D. Number	mdl07	Calibration Date	26/09/2024
SPT Rod Type	1 ½ Whitworth SPT	SPT Energy Ratio	.
Drilling Crew Details			CSCS No
Support Operative	Liam Ferrari		
Lead Driller	Jake Skeet		
Site category	Green		
Project Engineer			
Lead Driller's signature			

Project Title

Thakeham Tiles

Weather	Cloudy	Project No	1000
Date	10/09/2024	Day	Tuesday
Rig type	Comacchio 602	Borehole Number	
Inclination		Orientation	bh1
Sheet	3 of 7	Completed	Y

AGS

Produced by KeyLogbook

Marshall Drilling Ltd on behalf of Hydrock — Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
1.20	Grey clayey silt		RO		11.00	19.80		0200		100	grey											10.50	0.00
			RO		19.50	21.80		0030		100	grey											19.50	12.25
			RO		21.80	25.50		0000		100	grey											19.50	12.40
19.50	Grey sandstone																						

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0710	11.00	0.00	10.50
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1730	25.50	14.40	19.50

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer
C	203.00	10.50	19.50					8 inch			
RO	155.00	10.50	19.80				PCD			Air/Mist	No
RO		19.80	25.50	6 Inch DTHH	None		DTH Button Bit			Air/Mist	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
0710	0000	Arrive on site, set up
1000	0000	Noticed excess water arising at about 19.50m. Rotary bit refused at 19.80m.
1000	0020	Ran rods out of hole. Water dipping at 12.40m (10 mins after excess water arising observed). Dipping at 12.25m after 20 minutes.
1130	0200	Flush 8 inch casing to 19.50m, water run, fuel run
1330	0100	Prep down-the-hole hammer for use
1500	0100	Attempt to transfer water from skip into container. Pump not working- attempted unsuccessfully to fix
1700	0000	Stopped run at 25.50m due to uncontrollable arisings

SPT I.D. Number	mdl07	Calibration Date	26/09/2024
SPT Rod Type	1 ½ Whitworth SPT	SPT Energy Ratio	.
Drilling Crew Details		CSCS No	
Support Operative	Liam Ferrari		
Lead Driller	Jake Skeet		
Site category	Green		
Project Engineer			
Lead Driller's signature			

Project Title

Thakeham Tiles

Weather	Fine	Project No	1000
Date	11/09/2024	Day	Wednesday
Rig type	Comacchio 602	Borehole Number	
Inclination		Orientation	bh1
Sheet	4 of 7	Completed	Y

AGS

Produced by KeyLogbook

Marshall Drilling Ltd on behalf of Hydrock — Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0710	11.00	0.00	10.50
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1730	25.50	14.40	19.50

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
1730	0000	Secure site, leave to pick up working trash pump

SPT I.D. Number	mdl07	Calibration Date	26/09/2024
SPT Rod Type	1 ½ Whitworth SPT	SPT Energy Ratio	.
Drilling Crew Details			CSCS No
Support Operative	Liam Ferrari		
Lead Driller	Jake Skeet		
Site category	Green		
Project Engineer			
Lead Driller's signature			

Project Title

Thakeham Tiles

Weather	Fine	Project No	1000
Date	11/09/2024	Day	Wednesday
Rig type	Comacchio 602	Borehole Number	
Inclination		Orientation	bh1
Sheet	5 of 7	Completed	Y

AGS

Produced by KeyLogbook

Marshall Drilling Ltd on behalf of Hydrock — Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
			RO		25.50	27.90		0000		100	grey											19.50	14.40
			RO		27.90	58.00		0500		50	grey											19.50	14.40

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0700	25.50	14.40	19.50
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1730	58.00	14.20	19.50

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer
RO	155.00	25.50	58.00				DTH Button Bit			Air/Mist	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
0700	0100	Arrived on site, set up to drill, pumped skip water into tank
0900	0130	Discuss site mess issues with client, come up with a viable solution
1100	0130	Drive to pick up sand bags, fill sand bags on site, construct sediment containment system
1500	0000	Lost arisings at 45.50m- possible void. Proceeded with caution
1730	0000	Secure site, leave

SPT I.D. Number	mdl07	Calibration Date	26/09/2024
SPT Rod Type	1 ½ Whitworth SPT	SPT Energy Ratio	.
Drilling Crew Details			CSCS No
Support Operative	Liam Ferrari		
Lead Driller	Jake Skeet		
Site category	Green		
Project Engineer			
Lead Driller's signature			

Project Title

Thakeham Tiles

Weather	Fine	Project No	1000
Date	12/09/2024	Day	Thursday
Rig type	Comacchio 602	Borehole Number	
Inclination		Orientation	bh1
Sheet	6 of 7	Completed	Y

AGS

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Marshall Drilling Ltd on behalf of Hydrock — Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0715	56.50	14.20	19.50
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1900			

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
0715	0045	Arrive on site, hole dipping at 56.5m. Run hammer back in and clear out hole
1000	0600	Prep pipe for install, install borehole
1600	0300	Tidy site and demob

SPT I.D. Number	mdl07	Calibration Date	26/09/2024
SPT Rod Type	1 ½ Whitworth SPT	SPT Energy Ratio	.
Drilling Crew Details		CSCS No	
Support Operative	Liam Ferrari		
Lead Driller	Jake Skeet		
Site category	Green		
Project Engineer			
Lead Driller's signature			

Project Title

Thakeham Tiles

Weather	Fine	Project No	1000
Date	13/09/2024	Day	Friday
Rig type	Comacchio 602	Borehole Number	
Inclination		Orientation	bh1
Sheet	7 of 7	Completed	Y

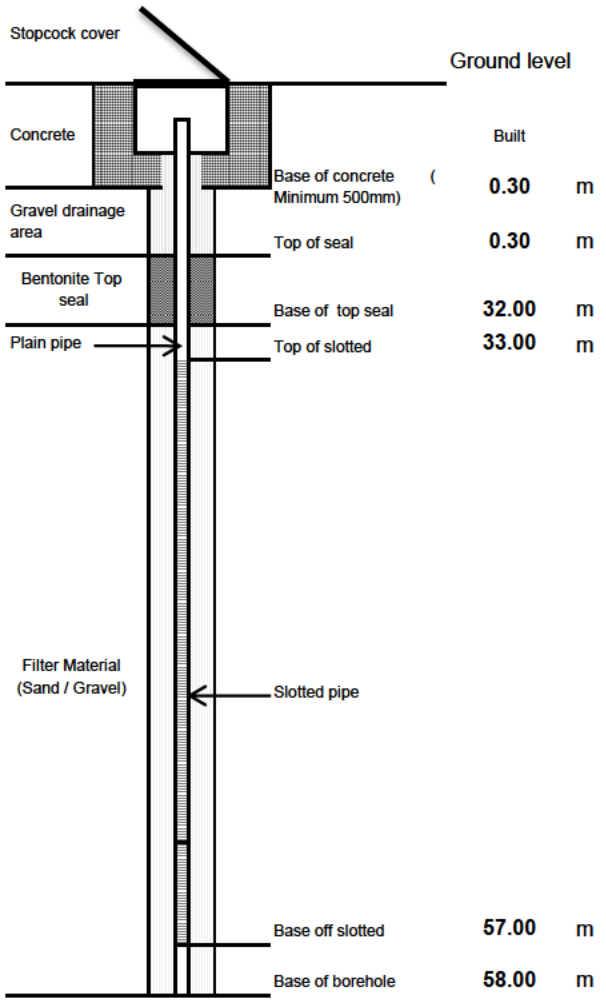
AGS

Produced by KeyLogbook

Marshall Drilling Ltd

Summary of Standpipe Installation

Schematic Diagram
(not to scale)



Installation Details

Standpipe diameter (id)	126	mm
Borehole diameter	250 & 203	mm
Slot size	2	mm
Geosock	Yes	
Gas tap	None	
Filter type	Gravel	
Type of cover	Upright	
Initial reading	0.00	m
Time of Initial reading	0000	hhmm

	Base (m)	Top (m)
Concrete	0.30	GL
Gravel drainage	0.30	0.30
Borehole seal top	32.00	0.30
Filter zone	58.00	32.00
Plain pipe	33.00	GL
Slotted zone	57.00	33.00
Base of borehole	58.00	

Remarks

1m sump of plain pipe from 57m to 58m. Lengths of install pipe differ slightly from manufacturer's specification, therefore installation depths are slightly different. Specifics recorded by Lily Cherry.

Rig type	Comacchio 602	**Project Title**			
Drilling Crew Details		Thakeham Tiles			
Support Operative	Liam Ferrari				
Lead Driller	Jake Skeet	**Project No**		1000	
Site category	Green	**Day**	Friday	**Date**	September 13, 2024
Engineer				**Borehole Number**	
Lead Driller's signature				**bh1**	

AGS

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Appendix E Pumping test data

Storrington Pumping Test Report

Site Name: Storrington
Client: Thakeham Tiles Ltd
Quote number: Q6203

Original date:	**03/10/2024**	Revision date:	**ORIGINAL ISSUE**
Document number	**1**	Version number	**ORIGINAL ISSUE**
Prepared By	**Francois Gous**	Approved By	**Michael Croney**

Version number	Revision Comments
1.0	Original Issue

1. Introduction

Project Dewatering Limited (PDL) were appointed by Thakeham Tiles ltd to undertake a pumping test at a site in Storrington. The purpose of the pumping test was to measure the yield of a newly constructed well to assess its suitability to yield 1 l/s sustainably for water supply purposes.

The Project Dewatering works included the installation of a pump, associated pipework and equipment and to perform a range of pumping tests.

This report details the practical works, the test results & observations noted during the tests. There is also a brief summary which gives guidance on potential further works.

2. Site location and system layout

Site Address: Rock Road,
Storrington,
RH20 3AD

Well Location: National Grif Ref: TQ 10352 15060

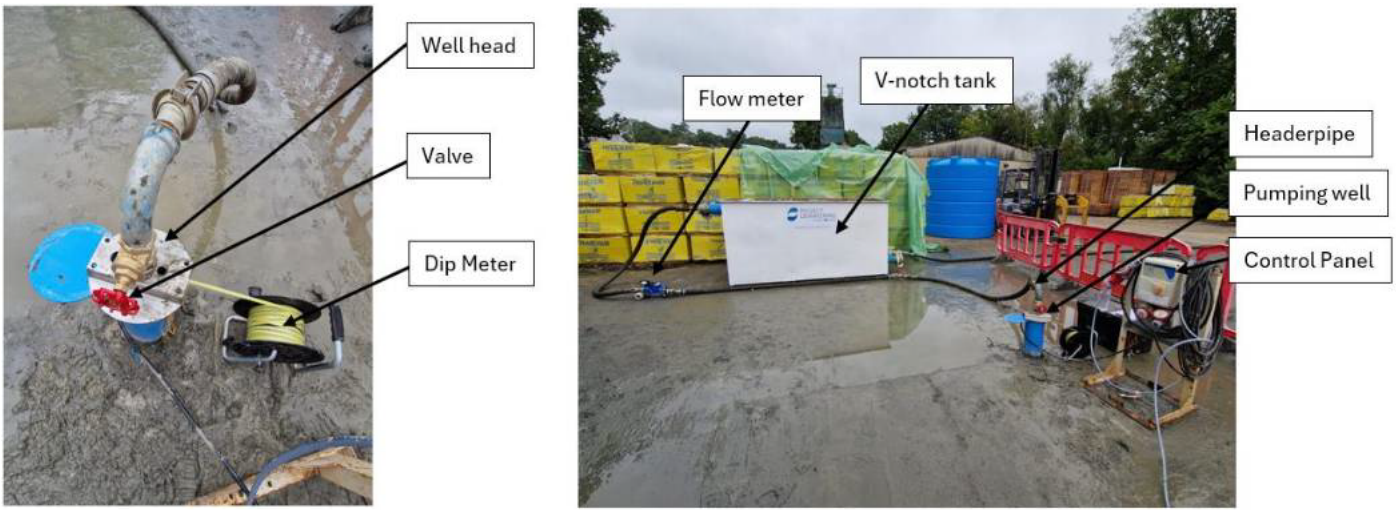


Figure 1: Site layout

3. Well specifications and geology

The pumping well (BH01) was drilled and installed by another company before PDL arrived to perform a pumping test. See well specifications below as provided to us:

Table 1: Borehole installation details

Borehole - BH01	
Depth (mbgl)	58
Well diameter (mm ID)	126
Top of slotted section (mbgl)	31.63
Base of slotted section (mbgl)	56.07
Cover style	Top hat

The geology sequence as provided by the drillers are summarised below:

Table 2: Geology sequence (Borehole log to be provided by others)

Geology	Depth to base (mbgl)
Made Ground	0.5
Fittleworth Member	27
Hythe Formation	58

4. Fieldwork methodology

Pump Installation and Pumping Test Commissioning

The pumping well was equipped with a 415V, 3 kW submersible borehole pump (**E-Tech VS 6/19**). The pump was coupled to a 50mm riser pipe which, in turn was connected to the wellhead. The wellhead included a pump flow control valve and rested on the top of the well casing.

The wellhead was connected to 2" discharge pipework with the length from the well location to the discharge point being approx. 30m. The discharge pipe included a pulse flowmeter (Octave DN 50) and a V-notch tank.

Date installed: 23/09/24

Groundwater Level Monitoring

A diver data-logger was placed inside the well to a depth of 30.2m. The logger took 5 second readings during the step test and was reduced to 2 seconds before commencing the 24 hour pumping test.

Groundwater level in the well were recorded manually using a conventional dip-meter throughout the duration of the step test and constant rate test. Water levels were taken from the top of the casing throughout the duration of the testing period.

Date installed: 23/09/24

Groundwater Flow Monitoring

A 2" pulse flow meter (Octave DN 50) measured the volume of water being discharged as well as the flow rate.

Date installed: 23/09/24

Equipment Test

An equipment test was conducted prior to the step pumping test to ensure all components were working effectively and to observe the drawdown in the well. This test is typically used to determine possible discharge rates for the step test, but PDL had already received the step discharge rates to ensure compliance with the maximum licensed discharge limit.

A borehole submersible pump was installed at a depth of 50.455 meters from the top of the casing, with a 2" riser pipe as described above.

The pumping system was equipped with two gate valves to set the required flow for the pump. After confirming that PDL could pump at the maximum step test discharge rate, the pump was switched off and the water level was allowed to recover overnight.

Date finished: 23/09/24

Step Test

The step tests comprised five identifiable steps, each lasting 60 minutes. Water levels were monitored in the well using diver data loggers and manual hand dips. The licensed abstraction limit for the borehole was 0.96 l/s during the long-duration test, but the steps were used to pump at higher flow rates (up to 1.67 l/s) to observe their impact on the pumping well. After the fifth step, the pump was switched off, and the recovery period began. The results are summarised in Section 4, Table 1, and are presented graphically in Appendix B.

Date finished: 24/09/24

Constant Rate Pumping Test

The pumping well recovered to the initial groundwater level quickly enough for PDL to begin the constant rate test on the same day. The proposed constant rate test was scheduled to run for 24 hours and could not exceed a discharge rate of 0.96 l/s. The step tests recorded minimal impact on the pumping well, so PDL was confident that we could set the flow at 0.96 l/s for the long-duration pumping test without the risk of emptying the well.

Date finished: 24/09/24

After manually monitoring the flow rate and groundwater level for the first 100 minutes of the test, PDL left the site, planning to resume the test the following day. Upon returning, PDL noted that the groundwater level in the well had only dropped by 0.015 meters. PDL continued to manually record the flow rate and groundwater level in the well until 24 hours of pumping was completed.

After the pump was switched off, the recovery period began. Typically, recovery needs to be monitored for 24 hours or until full recovery is achieved. Since the well had already recovered to a level higher than the initial groundwater level during the latter stages of the long-duration pumping test, PDL manually measured the groundwater level until it was time to leave the site.

Date finished: 25/09/24

The pumping setup, along with the equipment and pipework, was decommissioned on the morning of the 26th of September.

Date finished: 27/09/24

The results are summarised in Section 4, Table 2, and presented in Appendices C and D.

4. Program of testing and results

Step Test

The program is given in Table 1. Drawdown was calculated from the standing water level before the pump was switched on.

Table 3: Program of step test - Storrington

Well ID	Date tested (dd.mm.yyyy)	Time (mm:ss)	Maximum flow (l/s)	Drawdown (m)
Step Test				
BH01 (Step 1)	24.09.2024	09:00 – 10:00	0.56	0.01
BH01 (Step 2)	24.09.2024	10:00 – 11:00	0.83	0.015
BH01 (Step 3)	24.09.2024	11:00 – 12:00	1.11	0.025
BH01 (Step 4)	24.09.2024	12:00 – 13:00	1.39	0.03
BH01 (Step 5)	24.09.2024	13:00 – 14:00	1.67	0.035
BH01 (Recovery)	24.09.2024	14:00 – 15:40	-	

Constant Rate Test

Drawdown was calculated from the standing water level before the pump was switched on.

Table 4: Program of constant rate test - Storrington

Well ID	Pumping rate (l/s)	Standing water level (mbgl)	Pumped water level (mbgl)	Drawdown (m)	Distance from water to base of well (m)
BH01	0.96	14.775	14.77	-0.005*	41.3

*Intermittent rain was recorded during the later stages of the pumping test and could explain negative drawdown.

5. Yield calculation

Traditional analytical methods for constant rate pumping test interpretation were deemed impractical due to the extremely low drawdown in the pumping well. The maximum drawdown recorded during the entire pumping test (including both the step test and long-duration test) was 0.035m. This suggests that the aquifer is highly transmissive or that the pumping rate was very low relative to the aquifer's capacity. However, with such minimal drawdown, it is challenging to determine the well's sustainable yield, as typical industry-standard methods rely on the relationship between drawdown and pumping rate.

Verdict

Sustainable yield is defined as the discharge rate that will not cause the water level in the well to drop below a prescribed limit. Based on this, it could be said that the minimum sustainable yield of this well is 0.96 l/s. During the pumping tests, which included both a step test and a constant rate discharge test, the groundwater level in the pumping well did not drop below 0.035m. While the sustainable yield could potentially be much higher, without further tests and analysis, PDL can only speculate.

6. Final remarks and recommendations

Remarks

As mentioned in the previous chapter, the pumping well did not exhibit any noticeable drawdown during the pumping test. PDL believes this is due to the transmissivity of the primary aquifer and the hydraulic pressure from that aquifer. The primary aquifer, presumed to be the Hythe Formation, supplied the borehole with groundwater at a rate equal to or greater than the pumping rate during the constant rate test.
Please refer to the graphs presented in Appendices A and B. The diver data appears sporadic; while an overall trend can be discerned, the data points do not form a clean line as one might expect. This inconsistency arises due to:

1. The diver being installed at a depth of 30m. PDL anticipated more drawdown from the well and placed the diver at this depth to ensure the groundwater level would not drop below it. However, with the diver positioned at 30m and the maximum drawdown in the well being only 0.035m, the diver struggled to measure the very slight pressure differences acting upon it.
2. The drawdown in the well being almost negligible.

Recommendations

Ultimately, well yield analysis from a constant rate discharge test examines the relationship between the drawdown in a well and the time it takes to achieve this drawdown. If no or very little drawdown occurs, the methods used for analysis cannot be applied. To provide a more detailed assessment of the well's capabilities, the discharge rate of the constant rate pumping test needs to be increased. An elevated pumping rate will ensure that some drawdown is achieved in the pumping well.

Appendix A

Step Test data – EA FORM WR39

FORM WR39/2

PUMPING TEST DATA

STEP TEST – STEP 1

CONSENT NO.	Description of datum point from which measurements were made (eg ground level, flange, dip tube/other) **Top of Casing**
Pumping test at	Storrington Pumping Test
NGR	
Observations from	BH01
NGR	TQ337806

Height above ground level (metres): **0.35m**

Date	Time	Elapsed time		Depth of water level below datum (metres)	Drawdown (metres)	Meter readings **(m^3)** or Discharge rate (m^3/hr)	Comments (eg pump started, pumping rate changed, pump stopped)
		Minutes	Hours				Standing water level
		DAY (- 3)					
		DAY (- 2)					
		DAY (- 1)					
24/09/24	09:00	0	14.77			25	0.56 l/s (pump started)
		1	14.775				
		2	14.775				
		3	14.775				
		4	14.775				
		5	14.775			25.17	
		6	14.775				
		7	14.775				
		8	14.775				
		9	14.775				
		10	14.775			25.32	
		11	14.775				
		12	14.775				
		13	14.775				
		14	14.775				
		15	14.775			25.49	
		16	14.775				
		17	14.775				
		18	14.775				
		19	14.775				
		20	14.775			25.66	
		21	14.775				
		22	14.775				
		23	14.775				
		24	14.775				
		25	14.775			25.83	
		26	14.775				
		27	14.775				

FORM WR39/2

PUMPING TEST DATA

STEP TEST – STEP 1

CONSENT NO.							Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping Test at		Storrington Pumping Test					**Top of Casing**
NGR							
Observations from		BH01					Height above ground level (metres):
NGR		TQ337806					0.35 mbgl
Date	Time	Elapsed time		Depth of water level below datum (metres)	Drawdown (metres)	Meter readings (m^3) or Discharge rate (m^3/hr)	Comments (eg pump started, pumping rate changed, pump stopped)
		Minutes	Hours				
		28		14.775			
		29		14.775			
	09:30	30		14.775		25.99	
		35		14.775		26.16	
		40		14.775		26.33	
		45		14.775		26.50	
		50		14.775		26.66	
		55		14.78		26.83	
		60		14.78		26.99	

FORM WR39/2

PUMPING TEST DATA

STEP TEST – STEP 2

CONSENT NO.							Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping Test at		Storrington Pumping Test					**Top of Casing**
NGR							
Observations from		BH01					Height above ground level (metres):
NGR		TQ337806					0.35 mbgl
Date	Time	Elapsed time		Depth of water level below datum (metres)	Drawdown (metres)	Meter readings (m^3) or Discharge rate (m^3/hr)	Comments (eg pump started, pumping rate changed, pump stopped)
		Minutes	Hours				
	10:00	0		14.78		26.99	Step 2 = 0.83 l/s
		1		14.78			
		2		14.78			
		3		14.78			
		4		14.78			
		5		14.78		27.24	
		6		14.78			
		7		14.78			
		8		14.78			
		9		14.78			
		10		14.78		27.49	
		11		14.78			
		12		14.78			
		13		14.78			
		14		14.78			
		15		14.78		27.75	
		16		14.78			
		17		14.78			
		18		14.78			
		19		14.78			
		20		14.78		28.01	
		21		14.78			
		22		14.78			
		23		14.78			
		24		14.785			
		25		14.785		28.26	
		26		14.785			
		27		14.785			
		28		14.785			
		29		14.785			
	10:30	30		14.785		28.52	
		35		14.785		28.77	

FORM WR39/2

PUMPING TEST DATA

STEP TEST – STEP 2

CONSENT NO.							Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping Test at		Storrington Pumping Test					**Top of Casing**
NGR							
Observations from		BH01					Height above ground level (metres):
NGR		TQ337806					0.35 mbgl
Date	Time	Elapsed time		Depth of water level below datum (metres)	Drawdown (metres)	Meter readings (m^3) or Discharge rate (m^3/hr)	Height above ground level (metres):Comments
		40		14.785		29.02	
		45		14.785		29.26	
		50		14.785		29.51	
		55		14.785		29.75	
		60		14.785		29.99	

FORM WR39/2

PUMPING TEST DATA

STEP TEST – STEP 3

CONSENT NO.							Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping Test at		Storrington Pumping Test					**Top of Casing**
NGR							
Observations from		BH01					Height above ground level (metres):
NGR		TQ337806					0.35 mbgl
Date	Time	Elapsed time		Depth of water level below datum (metres)	Drawdown (metres)	Meter readings (m^3) or Discharge rate (m^3/hr)	Height above ground level (metres):Comments
11:00		0		14.785		29.99	Step 3 = 1.11 l/s
		1		14.79			
		2		14.79			
		3		14.79			
		4		14.79			
		5		14.79		30.32	
		6		14.79			
		7		14.79			
		8		14.79			
		9		14.79			
		10		14.79		30.66	
		11		14.79			
		12		14.79			
		13		14.79			
		14		14.79			
		15		14.79		30.98	
		16		14.79			
		17		14.79			
		18		14.79			
		19		14.79			
		20		14.79		31.3	
		21		14.795			
		22		14.795			
		23		14.795			
		24		14.795			
		25		14.795		31.63	
		26		14.795			
		27		14.795			
		28		14.795			
		29		14.795			
11:30		30		14.795		31.96	
		35		14.795		32.29	

Use continuation sheet (WR-39/4) if necessary

FORM WR39/2

PUMPING TEST DATA

STEP TEST – STEP 3			
CONSENT NO.			Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping Test at	Storrington Pumping Test		**Top of Casing**
NGR			
Observations from	BH01		Height above ground level (metres):
NGR	TQ337806		0.35 mbgl

Date	Time	Elapsed time		Depth of water level below datum (metres)	Drawdown (metres)	Meter readings (m^3) or Discharge rate (m^3/hr)	Height above ground level (metres):Comments
		40		14.795		32.62	
		45		14.795		32.95	
		50		14.795		33.28	
		55		14.795		33.60	
		60		14.795		33.94	

Use continuation sheet (WR-39/4) if necessary

FORM WR39/3

PUMPING TEST DATA

STEP TEST – STEP 4

CONSENT NO.						Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping Test at	Storrington Pumping Test					**Top of Casing**
NGR						
Observations from	BH01					Height above ground level (metres):
NGR	TQ337806					0.35 mbgl

Date	Time	Elapsed time	Depth of water level below datum (metres)	Drawdown (metres)	Meter readings (m^3)	Comments (eg duration of any rainfall, time when pump switched on and off if an operating well or borehole)
	12:00	0	14.795		33.93	Step 4 = 1.39 l/s
		1	14.795			
		2	14.80			
		3	14.80			
		4	14.80			
		5	14.80		34.34	
		6	14.80			
		7	14.80			
		8	14.80			
		9	14.80			
		10	14.80		34.75	
		11	14.80			
		12	14.80			
		13	14.80			
		14	14.80			
		15	14.80		35.17	
		16	14.80			
		17	14.80			
		18	14.80			
		19	14.80			
		20	14.80		35.60	
		21	14.80			
		22	14.80			
		23	14.80			
		24	14.80			
		25	14.80		36.01	
		26	14.80			
		27	14.80			
		28	14.80			
		29	14.80			
	12:30	30	14.80		36.43	

Use continuation sheet (WR-39/4) if necessary

FORM WR39/4

PUMPING TEST DATA

STEP TEST – STEP 4

CONSENT NO.							Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping Test at		Storrington Pumping Test					**Top of Casing**
NGR							
Observations from		BH01					Height above ground level (metres):
NGR		TQ337806					0.35 mbgl
Date	Time	Elapsed time		Depth of water level below datum (metres)	Drawdown (metres)	Meter readings (m^3)	Comments
		Minutes	Hours			36.84	
		35		14.80		36.84	
		40		14.80		37.26	
		45		14.80		37.68	
		50		14.80		38.10	
		55		14.80		38.49	
		60		14.80		38.90	

FORM WR39/3

PUMPING TEST DATA

STEP TEST – STEP 5

CONSENT NO.			Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping Test at	Storrington Pumping Test		**Top of Casing**
NGR			
Observations from	BH01		Height above ground level (metres):
NGR	TQ337806		0.35 mbgl

Date	Time	Elapsed time	Depth of water level below datum (metres)	Drawdown (metres)	Meter readings (m^3)	Comments (eg duration of any rainfall, time when pump switched on and off if an operating well or borehole)
	13:00	0	14.8		38.9	Step 5 = 1.67 l/s
		1	14.805			
		2	14.805			
		3	14.805			
		4	14.805			
		5	14.805		39.40	
		6	14.805			
		7	14.805			
		8	14.805			
		9	14.805			
		10	14.805		39.92	
		11	14.805			
		12	14.805			
		13	14.805			
		14	14.805			
		15	14.805		40.42	
		16	14.805			
		17	14.805			
		18	14.805			
		19	14.805			
		20	14.805		40.92	
		21	14.805			
		22	14.805			
		23	14.805			
		24	14.805			
		25	14.805		41.38	
		26	14.805			
		27	14.805			
		28	14.805			
		29	14.805			
	13:30	30	14.805		41.83	

Use continuation sheet (WR-39/4) if necessary

FORM WR39/4

PUMPING TEST DATA

STEP TEST – STEP 4

CONSENT NO.							Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping Test at		Storrington Pumping Test					**Top of Casing**
NGR							
Observations from		BH01					Height above ground level (metres):
NGR		TQ337806					0.35 mbgl
Date	Time	Elapsed time		Depth of water level below datum (metres)	Drawdown (metres)	Meter readings (m^3)	Comments
		Minutes	Hours				
		35		14.805		42.33	
		40		14.805		42.82	
		45		14.805		43.32	
		50		14.805		43.80	
		55		14.805		44.31	
		60		14.805		44.83	

FORM WR39/4

PUMPING TEST DATA

STEP TEST – Recovery							
CONSENT NO.							Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping Test at		Storrington Pumping Test					**Top of Casing**
NGR							
Observations from		BH01					Height above ground level (metres):
NGR		TQ337806					0.35 mbgl
Date	Time	Elapsed time		Depth of water level below datum (metres)	Drawdown (metres)		Comments
		0		14.805			
		1		14.78			
		2		14.78			
		3		14.78			
		4		14.78			
		5		14.78			
		6		14.78			
		7		14.78			
		8		14.78			
		9		14.78			
		10		14.78			
		11		14.78			
		12		14.775			
		13		14.775			
		14		14.775			
		15		14.775			
		16		14.775			
		17		14.775			
		18		14.775			
		19		14.775			
		20		14.775			Recovered to initial level
		21					
		22					
		23					
		24					
		25					
		26					
		27					
		28					
		29					
		30					
		35					
		40					
		45					
		50					

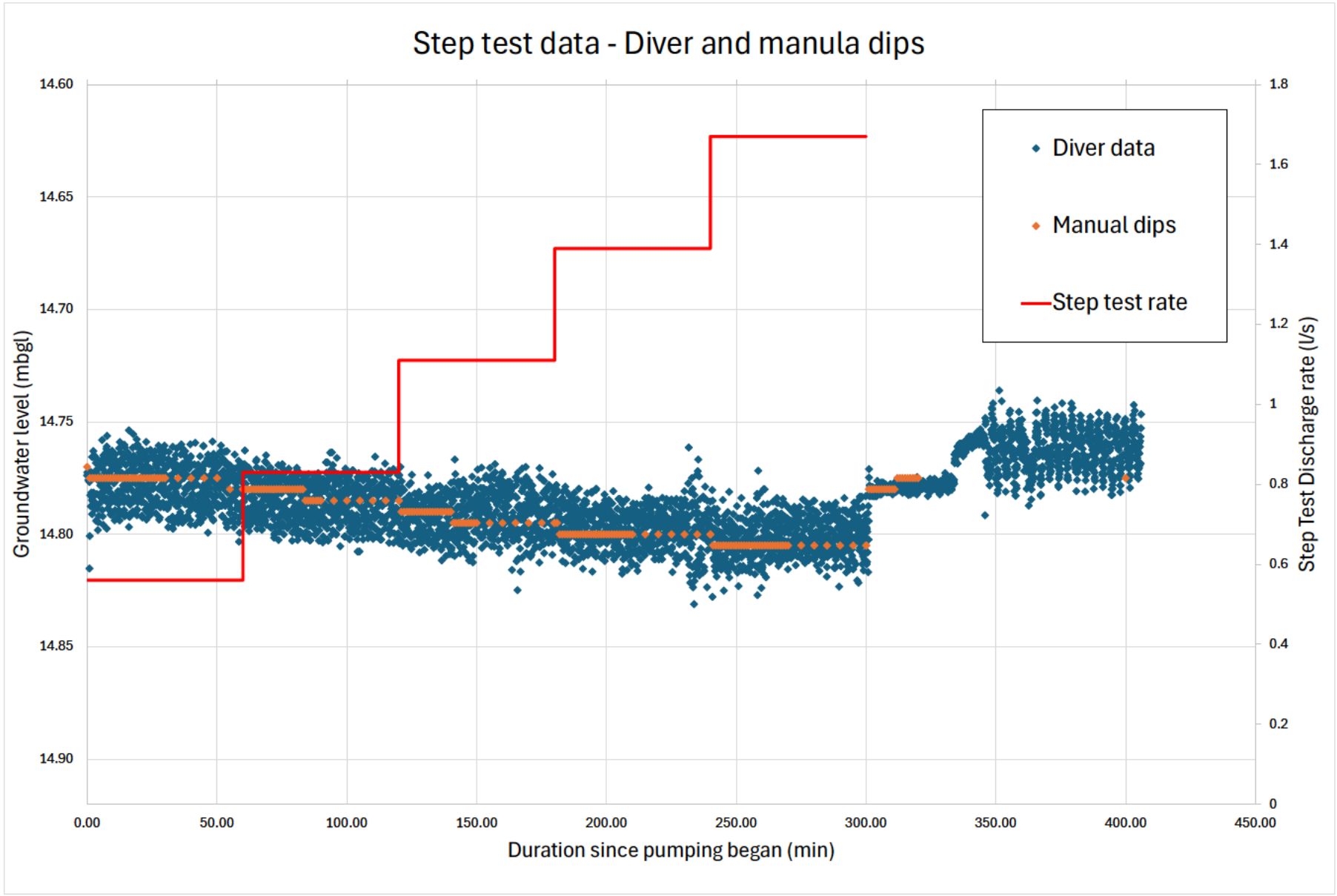
FORM WR39/4

PUMPING TEST DATA

STEP TEST – Recovery							
CONSENT NO.							Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping Test at	Storrington Pumping Test						**Top of Casing**
NGR							
Observations from	BH01						Height above ground level (metres):
NGR	TQ337806						0.35 mbgl
Date	Time	Elapsed time		Depth of water level below datum (metres)	Drawdown (metres)		Comments
		55					
		60					
		70					
		80					
		90					
		100		14.775			
		110					
		120					
		140					
		160					
		180					
		200					
		220					
		240					
		260					
		300					End of recovery
		350					(start of constant rate test)
		400					

Appendix B

Step Test data – Dip meter and manual dips with graphical presentation.


Step test data - Diver and manula dips
Groundwater level (mbgl)
14.60
14.65
14.70
14.75
14.80
14.85
14.90
Step Test Discharge rate (l/s)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
Duration since pumping began (min)
Diver data
Manual dips
Step test rate

Appendix C

Constant rate test – EA FORM WR39

FORM WR39/1

PUMPING TEST DATA

CONSTANT RATE PUMPING TEST							
CONSENT NO.							Description of datum point from which measurements were made (eg ground level, flange, dip tube/other)
Pumping test at		Storrington Pumping Test					**Top of Casing**
NGR							
Observations from		BH01					Height above ground level (metres):
NGR		TQ337806					**0.35m**
Date	Time	Elapsed time		Depth of water level below datum (metres)	Drawdown (metres)	Meter readings (m^3) or Discharge rate (m^3/hr)	Comments (eg pump started, pumping rate changed, pump stopped)
		Minutes	Hours				Standing water level at start
		DAY (- 3)					of constant rate test: 14.775
		DAY (- 2)					
		DAY (- 1)					
24/09/24	15.45	0		14.775		44.85	0.97 l/s
		1		14.785			
		2		14.785			
		3		14.785			
		4		14.785			
		5		14.785		45.16	
		6		14.785			
		7		14.785			
		8		14.785			
		9		14.785			
		10		14.785		45.45	
		12		14.785			
		14		14.785			
		16		14.785			
		18		14.785			
		20		14.79		46.01	
		25		14.79		46.31	
		30		14.79		46.60	
		35		14.79		46.88	
		40		14.79		47.17	
		45		14.79		47.46	
		50		14.79		47.74	
		55		14.79		48.03	
		60	1	14.79		48.31	
		70		14.79		48.88	
		80		14.79		49.45	
		90		14.79		50.02	
		100		14.79		50.60	PDL left site