# A303 Amesbury to Berwick Down

## Applicant's provision of technical reports supporting the Environmental Information Review

Pumping Test Factual Report

Document reference: Redetermination 2.23

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

February 2022

# PUMPING TEST FACTUAL REPORT

## Stonehenge A303: Pumping test W617

| Revision | Author | Reviewed by | Approved by | Date of Approval | Reason for revision |
|---|---|---|---|---|---|
| Rev.1 | M. Welsford | M. Pickett | D. Wright | 31/3/2021 | First Issue |
| Rev.2 | M. Welsford | M. Pickett | D. Wright | 19/4/2021 | Clients Comments |
| | | | | | |

# Contents

# 1. Introduction

Stuart Wells Limited. (SWL) were appointed by RPS Consulting UK & Ireland to undertake a pumping test south of Stonehenge UNESCO World Heritage Site in accordance with BS EN ISO 14686:2003 Hydrometric determinations - Pumping tests for water wells - Considerations and guidelines for design, performance and use (supersedes BS6316:1992); and BS EN ISO22282-1:2012 Geotechnical investigation and testing - Geohydraulic testing Part 1: General Rules; and BS EN ISO22282-1:2012 Geotechnical investigation and testing - Geohydraulic testing Part 4. Additional water sampling was undertaken in accordance with BS ISO 5667-3:2018 Water quality. Sampling. Preservation and handling of water samples". All site works were undertaken in accordance with 'SWS-RAMS-PT-P2139'.

The pumping test scope of works was detailed in, 'A303 Phase 7B ICE SPECIFICATION SCHEDULE 5. Document Ref: HE551506-AMW-VGT-SW_ZZ_ZZ_ZZ-CD-GS-6000455 June 2020'(Appendix 2) and in accordance with, 'Environmental Agency CONSENT TO INVESTIGATE A GROUNDWATER SOURCE SWWGIC097-2' (Appendix 1). The objective of the test was to collect additional hydrogeological information of the Chalk South of Stonehenge to aid design for the proposed tunnel.

This pumping test was undertaken in an existing well W617, installed as part of Phase 6 A303 Ground Investigation in 2018 (BH log within Appendix), with abstracted groundwater discharged through a 200mm Ø pipeline to ground a nominal 800 metres south of the pumping well.

In summary the pumping test consisted of:

- Pre-test monitoring period
- Equipment test
- Post equipment test monitoring period
- 5no x 100min Step-tests
- 3-day Constant rate test at a flow rate of 14l/s.
- 4-day Post-Test Monitoring

Groundwater levels were monitored manually and electronically using Solinst dataloggers in 7no. monitoring wells and 1 no. pumping well;

- W617
- RX633
- R71907
- R618
- R619
- R620
- RX621
- RX622

Atmospheric pressure was measured using two Solinst barometric loggers located at the well head and rainfall wasmeasured using a EML Rain Gauge with datalogger at the well head. In situ groundwater quality measurements were measured using an In-situ SmarTROLL located at the well head. Well locations and indicative pumping test layout is shown in Figure1 below.

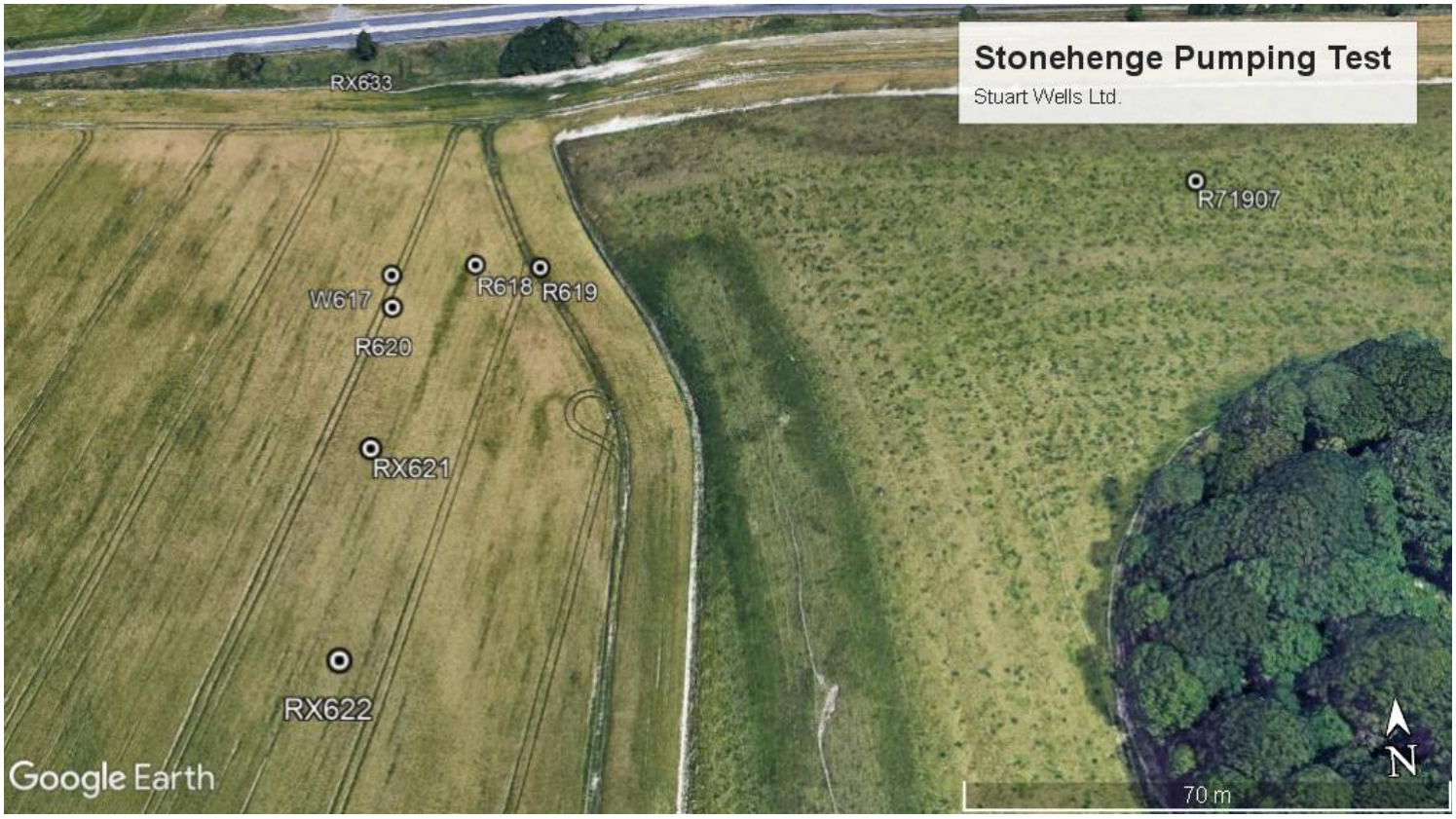



Figure 1: Pumping test well locations

# 2. Fieldwork

SWL mobilised to RPS's Stonehenge compound on 1st March 2021. Fully demobilising from site on 31st March 2021. A summary programme of works undertaken on site is outlined in Table 1 below.

| Date | Works Undertaken |
|---|---|
| 1st March 2021 | **Arrival on-site and Borehole Check** |
| 2nd March 2021 | **Installation of Dataloggers** |
| 3rd March – 10th March 2021 | **Setting up Pumping test Equipment and Compound**<br>Caprari E8P95-6/5A-V Borehole Pump Installation on 10th March |
| 3rd March – 11th March 2021 | **Pre-Test Monitoring: Groundwater**<br>Loggers at 30 second intervals |
| 11th March 2021 | **Equipment Test**<br>Comprised of 4 no. pumping phases. |
| 11th – 15th March | **Equipment Test Recovery** |
| 15th March 2021 | **Step-Testing**<br>5 Steps; 7.6l/s, 10.5l/s, 13.3l/s, 16.2l/s and 19l/s |
| 15th – 16th March 2021 | **Recovery Monitoring**<br>96-hour monitoring period |
| 16th March – 19th March 2021 | **Constant Rate Pumping**<br>• 3 no. days constant pumping at 14l/s<br>• On the 18th March 2021 the flow rate and groundwater level dropped. It was determined by the client that before the water level drew down to intake a controlled recovery would be undertaken.<br>• 2 no. sample. One after 1 hr and one prior recovery. |
| 19th to 23rd March 2021 | **Recovery Monitoring**<br>96-hour recovery monitoring period. Removal of all dataloggers on 23rd March. |
| 23rd March – 31st March 2021 | **Demobilisation**<br>Borehole pump removed 29th March |

Table 1: Programme of Site Works Undertaken

## 2.1 Equipment and Set-Up

SWL set-up the pumping test equipment at the abstraction well, W617. All the equipment utilised during the pumping test is summarised as follows.

- 2 no. 110kw Stuart Power FG Wilson generators (and associated cabling).
- 1 no. Stuart Power fuel bowser c/w long leads.
- 2 no. DN150 Mag 2000 flowmeters (and associated cabling).
- 1 no. AMF panel (and associated cabling).
- 1 no. distribution box (and associated cabling).
- 1 no. pump soft starter box.
- 1 no. Caprari E8P95/3A-V (415V 26kW) submersible borehole pump at 44 mBTOC on 3" galvanised steel riser.
- 1 no. well head with sampling tap and gate valve.
- 1 no. portable In-Situ SmarTROLL water quality probe for surface water quality measurements.
- 1 no. 32mm ID and 19mm ID piezometers for dipping and datalogger, installed in W617.
- 2 no. Solinst barometric dataloggers.

- 8 no. Solinst water Level dataloggers.
- 1 no. rain gauge.
- 800m x 8" Bauer discharge pipeline, v-Notch tank and two further 150m 6" discharge lines with multiple outlets and scour protection at discharge points.

The Caprari E8P95/3A-V submersible borehole pump was installed in W617 on 3" steel riser on the 10th March 2021 using a Dando 4000 cable percussion drilling rig,. Following an instruction from AECOM during the equipment test, the borehole pump was deemed adequate to accommodate the predicted flowrates anticipated during testing and was utilised as such. The borehole pump was removed using the same method on 29th March 2021. Lifting operations were undertaken using an approved lift plan and lifting supervisor.

Figure 2: Discharge point and v-notch images

## 2.2 Monitoring Set-Up

SWL undertook monitoring of groundwater levels, rainfall, and atmospheric pressure during the pumping test, summarised in Table 2 below.

| Parameter | Monitoring Undertaken |
|---|---|
| **Groundwater Levels** | Monitored in 8 no. boreholes.<br>• W617<br>• RX633<br>• R71907<br>• R618<br>• R619<br>• R620<br>• RX621<br>• RX622 |
| **Flow Monitoring** | • 2 x DN150 Mag 2000 flowmeters located at the wellhead<br>• 1 x V-Notch located at the discharge location |
| **Barometric Pressure** | • Measured using 2no x Solinst barometric pressure dataloggers installed at the pumping well. |
| **Rain Gauge** | • Measured using an EML rain gauge c/w datalogger at the pumping well. |
| **Water Sampling and Groundwater Quality Monitoring** | • 2no x water samples taken from the wellhead sample tap from pumping well, one within 1hr and one at the end of testing.<br>• Hourly for the first 12 hours water quality field parameter data on pH, specific conductivity (µS/cm) and temperature were taken from the pumping well. Thereafter twice daily. |

Table 2: Monitoring Undertaken on-site by SWL

# 3. Testing

The following section outlines the results of the Pumping test.

## 3.1 Pre-Test Monitoring

Pre-test monitoring was undertaken from 3rd March – 11th March 2021 comprising of 8 days of groundwater, atmospheric pressure and rainfall monitoring. Dataloggers were set to 30 second readings, *see Table 3* for a summary of the groundwater level data. Table 3 outlines the range of groundwater levels seen in all wells associated with the pumping test and the groundwater level prior to the step test.

| Well No | Water Level Variation (mAOD) | Groundwater Level Prior to Step-Test (mAOD) |
|---|---|---|
| **W617** | 73.19 – 73.67 | 72.91 |
| **R618** | 73.19 – 73.57 | 72.91 |
| **R619** | 72.79 – 73.17 | 72.49 |
| **R620** | 72.60 – 72.98 | 72.31 |
| **RX621** | 72.98 – 73.37 | 72.69 |
| **RX622** | 72.90 – 73.31 | 72.29 |
| **RX633** | 72.58 – 72.96 | 72.35 |
| **R71907** | 72.64 – 73.02 | 72.34 |

Table 3: Summary of Pre-Test Monitoring Groundwater Level Data

## 3.2 Equipment Test

After the installation of the Caprari E8P95/3A-V submersible borehole pump on the 10th March 2021 an equipment test was undertaken on the 11th March 2021 between 10:00 - 15:00, to determine that allsite equipment was working accordingly, this comprised of 4 no. pumping phases testing flows from 4 – 19l/s. and comprised of checking the; generators, electrical equipment, borehole pump, flowmeters, pipework, v-notch and discharge point (please see section 2.1 for a full breakdown of equipment utilised for testing). The equipment test was undertaken successfully.

## 3.3 Step-Test

5 no x 100 min step tests were undertaken on the 15th March 2021, pumping at rates of:

- Step No.1 - 7.6 l/s – 45780 litres abstracted (09:00 – 10:40)
- Step No.2 - 10.5 l/s – 63089 litres abstracted (10:40 – 12:20)
- Step No.3 - 13.3 l/s – 79547 litres abstracted (12:20 – 14:00)
- Step No.4 - 16.2 l/s – 96968 litres abstracted (14:00 – 15:40)
- Step No.5 - 19 l/s – 39967 litres abstracted (15:40 – 16:15 failed step)

See Table 4, Figure 5 and 6 for a summary of the step test data. For all data related to the step testing see associated excel file SWL2139-W617 Step-Testing data. Whilst undertaking the 5th step, the groundwater level drew down to pump intake and the test was terminated early to prevent damage to the borehole pump.

| Well No | Step 1 | | Step 2 | | Step 3 | | Step 4 | | Step 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Water Level (mAOD) | Drawdown (metres) | Water Level (mAOD) | Drawdown (metres) | Water Level (mAOD) | Drawdown (metres) | Water Level (mAOD) | Drawdown (metres) | Water Level (mAOD) | Drawdown (metres) |
| **W617** | 72.11 | 0.80 | 71.66 | 1.25 | 69.36 | 3.54 | 62.99 | 9.92 | 40.09 | 32.82 |
| **R618** | 72.60 | 0.09 | 72.55 | 0.14 | 72.44 | 0.25 | 72.31 | 0.38 | 72.24 | 0.45 |
| **R619** | 72.29 | 0.02 | 72.27 | 0.04 | 72.25 | 0.06 | 72.22 | 0.09 | 72.21 | 0.10 |
| **R620** | 72.36 | 0.25 | 72.22 | 0.39 | 71.94 | 0.67 | 71.68 | 0.93 | 71.59 | 1.02 |
| **RX621** | 72.24 | 0.05 | 72.18 | 0.10 | 72.12 | 0.17 | 72.04 | 0.24 | 72.01 | 0.27 |
| **RX622** | 72.34 | 0.01 | 72.32 | 0.03 | 72.30 | 0.06 | 72.26 | 0.09 | 72.23 | 0.12 |
| **RX633** | 72.89 | 0.02 | 72.87 | 0.05 | 72.84 | 0.08 | 72.80 | 0.11 | 72.78 | 0.13 |
| **R71907** | 72.49 | 0.01 | 72.48 | 0.02 | 72.47 | 0.03 | 72.46 | 0.04 | 72.44 | 0.05 |

Table 4: Summary of Step-Test Data

## 3.4 Constant Rate Test

The constant rate testing began at 12:30 on 16th March 2021 and ended at 09:30 on 19th March 2021, the test was undertaken at an abstraction rate of 14l/s. After 48 hours of pumping significant and unexpected drawdown was identified within the abstraction well whilst pumping at a stable rate of 14l/s.

The client instructed SWL to cease the pumping test and commence recovery at 09:30 on the 19th March 2021. See Table 5 and Figures 7,8 and 9 for a summary of the Constant Rate Testing data.

For all data related to the constant rate see associated excel data SWL2139-W617 Constant Rate Testing Data.

| Well No. | Easting | Northing | Distance from Pumped Pell | Ground Elevation | Lowest Water Level | Maximum Drawdown |
|---|---|---|---|---|---|---|
| | | | (m) | (mAOD) | (mAOD) | (m) |
| **W617** | 412751.0 | 141969.0 | - | 79.60 | 39.44 | 33.33 |
| **R620** | 412752.0 | 141959.0 | 10 | 79.56 | 70.88 | 1.59 |
| **R618** | 412771.0 | 141969.0 | 20 | 79.51 | 71.65 | 0.91 |
| **R619** | 412786.0 | 141969.0 | 35 | 79.58 | 71.70 | 0.49 |
| **RX621** | 412751.0 | 141919.0 | 50 | 79.87 | 71.31 | 0.84 |
| **RX622** | 412750.0 | 141870.0 | 99 | 80.58 | 71.61 | 0.62 |
| **RX633** | 412739.9 | 142040.3 | 72.15 | 80.91 | 72.20 | 0.59 |
| **R71907** | 412939.1 | 141968.9 | 188 | 98.35 | 71.93 | 0.45 |

Table 5: Constant Rate Distance Drawdown Summary

## 3.5 Groundwater Sampling

The certificates of analysis from the laboratory are provided in the appendix. Groundwater samples were taken from the wellhead sample tap on W617 during the constant rate test. The first within one hour of commencement of the constant rate test andthe second just prior to the borehole pump being switched off, the end of the constant rate test. These were undertaken in accordance with BS ISO 5667-3:2018.

Spot groundwater measurements were undertaken hourly for the first 12 hours and then twice daily thereafter. Field parameter data was collected using a SmarTROLL MP measuring, pH, specific conductivity (µS/cm) and temperature which were collected from the pumping well sample tap.

Table 6 below summarises stabilised field parameter water quality data from the constant rate test. Full results are available in excel SWL2139-W617 Water Quality Testing Data, which show all data collected at each spot test prior to stabilisation.

| Date Time | Time | Actual Conductivity (µS/cm) | Temperature (°C) | Specific Conductivity (µS/cm) | pH (pH) |
|---|---|---|---|---|---|
| 16/03/2021 13:38 | 13:38:49 | 497.53 | 12.17 | 659.02 | 7.33 |
| 16/03/2021 14:46 | 14:46:50 | 477.43 | 11.93 | 636.15 | 7.79 |
| 16/03/2021 15:16 | 15:16:10 | 494.19 | 11.93 | 658.45 | 7.46 |
| 16/03/2021 16:44 | 16:44:32 | 488.72 | 11.47 | 658.88 | 7.39 |
| 16/03/2021 17:43 | 17:43:16 | 485.04 | 11.24 | 657.92 | 7.38 |
| 16/03/2021 18:53 | 18:53:28 | 477.97 | 10.82 | 655.43 | 7.45 |
| 16/03/2021 19:45 | 19:45:03 | 478.38 | 10.81 | 656.18 | 7.40 |
| 16/03/2021 20:40 | 20:40:01 | 475.09 | 10.57 | 655.83 | 7.39 |
| 16/03/2021 21:40 | 21:40:03 | 475.00 | 10.45 | 657.77 | 7.30 |
| 16/03/2021 22:39 | 22:39:39 | 474.33 | 10.49 | 656.07 | 7.30 |
| 16/03/2021 23:40 | 23:40:01 | 469.12 | 10.21 | 653.67 | 7.33 |
| 17/03/2021 00:40 | 00:40:08 | 469.52 | 10.49 | 649.40 | 7.27 |
| 17/03/2021 09:17 | 09:17:46 | 434.34 | 10.76 | 596.59 | 6.97 |
| 17/03/2021 18:11 | 18:11:46 | 434.20 | 10.75 | 596.56 | 7.37 |
| 18/03/2021 09:02 | 09:02:10 | 458.15 | 11.01 | 625.19 | 7.28 |
| 18/03/2021 17:30 | 17:30:22 | 459.73 | 11.05 | 626.71 | 7.65 |
| 19/03/2021 09:22 | 09:22:03 | 449.26 | 11.10 | 611.53 | 7.19 |

Table 6: Water Quality Results for pumping

## 3.6 Recovery Monitoring

The recovery period was monitored for 96 hours using manual dips and dataloggers at 30 second intervals. SWL removed all monitoring equipment on the 23rd March 2021 as per AECOM's instruction, monitoring boreholes were re-installed with telemetry monitoring system by AECOM.

See Figures 7 and 8 for a summary of the recovery data. For all data related to the recovery see associated excel data SWL2139-W617 Constant Rate Testing Data.

## 3.7 Post-Test

Post-test, Stuart Wells Ltd. removed all equipment from site. During the installation of the Caprari E8P95/3A-V (415V 26kW) submersible borehole pump in W617, the well head protection had to be removed due to lifting restrictions, this was reinstated with post-crete post-pump removal. All dataloggers were removed on the 23rd March 2021 and all pipework and pumping equipment was dissembled and removed from site by 31st March 2021.

## 3.8 Data Files Associated with Report

Associated with this report and testing undertaken by Stuart Wells are the following data files.

**Pumping Test Groundwater Data**
- SWL2139- Stonehenge Pumping Test Pre-Test and Equipment Testing Data Rev.1.Excel
- SWL2139- Stonehenge Pumping Test Constant Rate Testing Data Rev.1.xcel
- SWL2139- Stonehenge Pumping Test Step-Testing Data Rev.1.Excel

**Surface Water, Rainfall and Barometric Data**
- SWL2139- Stonehenge Pumping Test Rain Gauge Data Rev.1.Excel
- SWL2139-W617 Stonehenge Pumping Test Barometric Data Rev.1.Excel
- March Amesbury-flow-15min-Measured.CSV
- Shrewton Met Data-StepT&CRT&Recovery.XLSX

**Groundwater Quality and Laboratory Data**
- SWL2139- Stonehenge Pumping Test In-Field Water Quality Testing Rev.1.Excel
- 21317-67-MCERTS-COMPLETE-2021-03-24.pdf

**Borehole Logs**
- ii.R618.pdf
- ii.R619.pdf
- ii.R620.pdf
- ii.R71907.pdf
- ii.RX621.pdf
- ii.RX622.pdf
- ii.RX633.pdf
- ii.W617.pdf

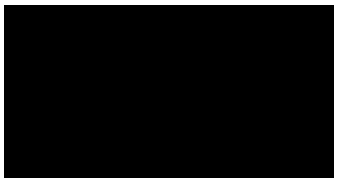
**Calibration Records**
- SWL2139-Stonehenge Pumping Test Datalogger Calibration Certs'
- SWL2139 - Stonehenge Pumping Test DN150 Mag 2000 Flowmeters Calibration Records
- SmarTROLL MP Calibration_479040_2021_16-19_03_2021

**Specification**
- Annex D5 from June 2020 HE Spec
- 2054 210204 A303 Section 32 Consent_WR37_2021 Re-issue FINAL

**Work RAMS**
- Stonehenge Phase 7B Pumping Test RAMS Rev.02

For all pumping test data please see files and spreadsheets referenced and associated with this report.

Yours faithfully,



Martin Welsford BSc FGS

Groundwater Engineer
For & on behalf of Stuart Wells

Dr Mark Pickett PhD, MCSM, BEng (Hons) FGS

Technical Director
For & on behalf of Stuart Wells

David Wright BSc CGeol

Director & Principal
Groundwater Engineer
For & on behalf of Stuart Wells

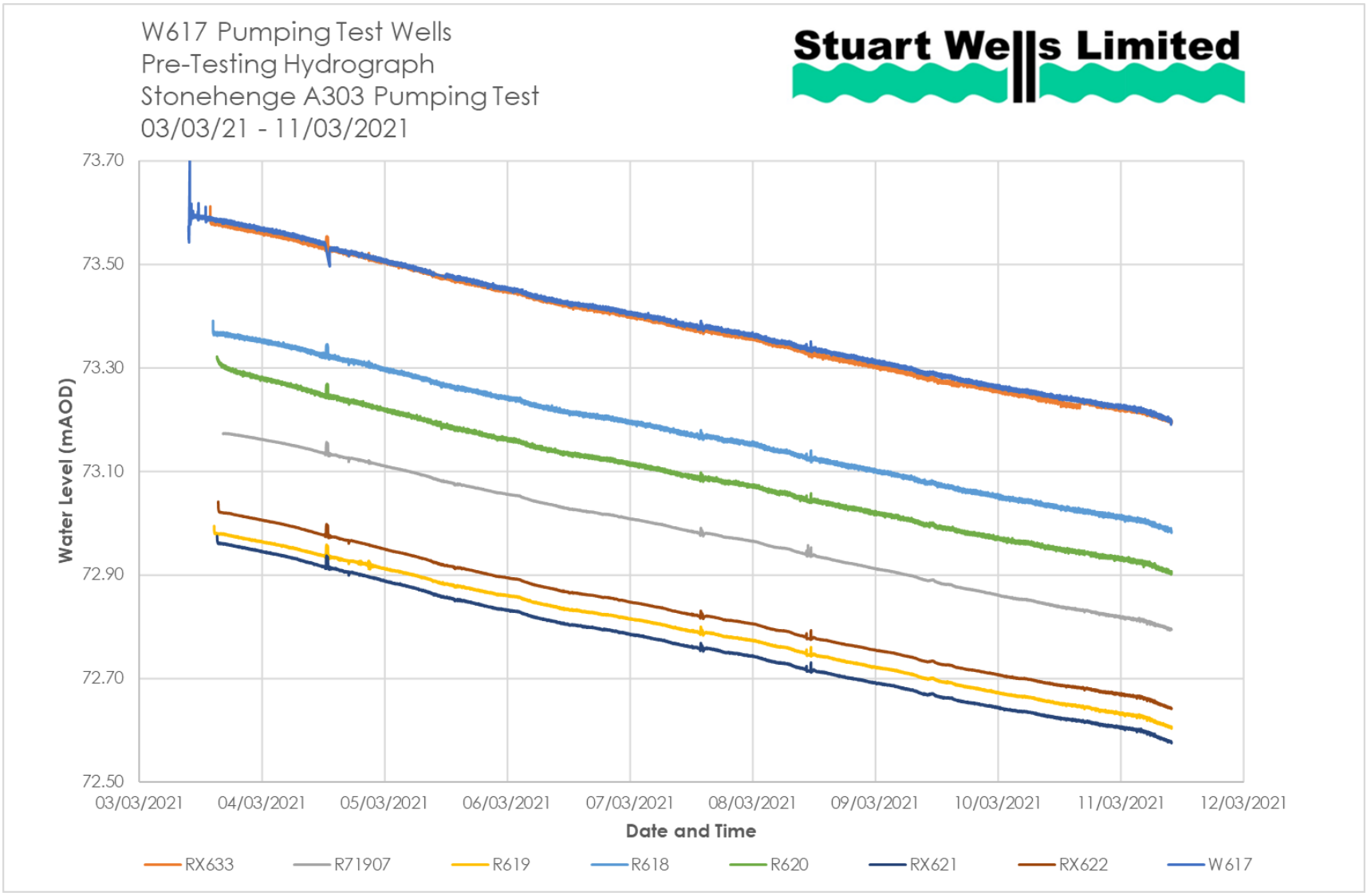



Figure 3 Pre-Test Monitoring Groundwater Levels Hydrograph

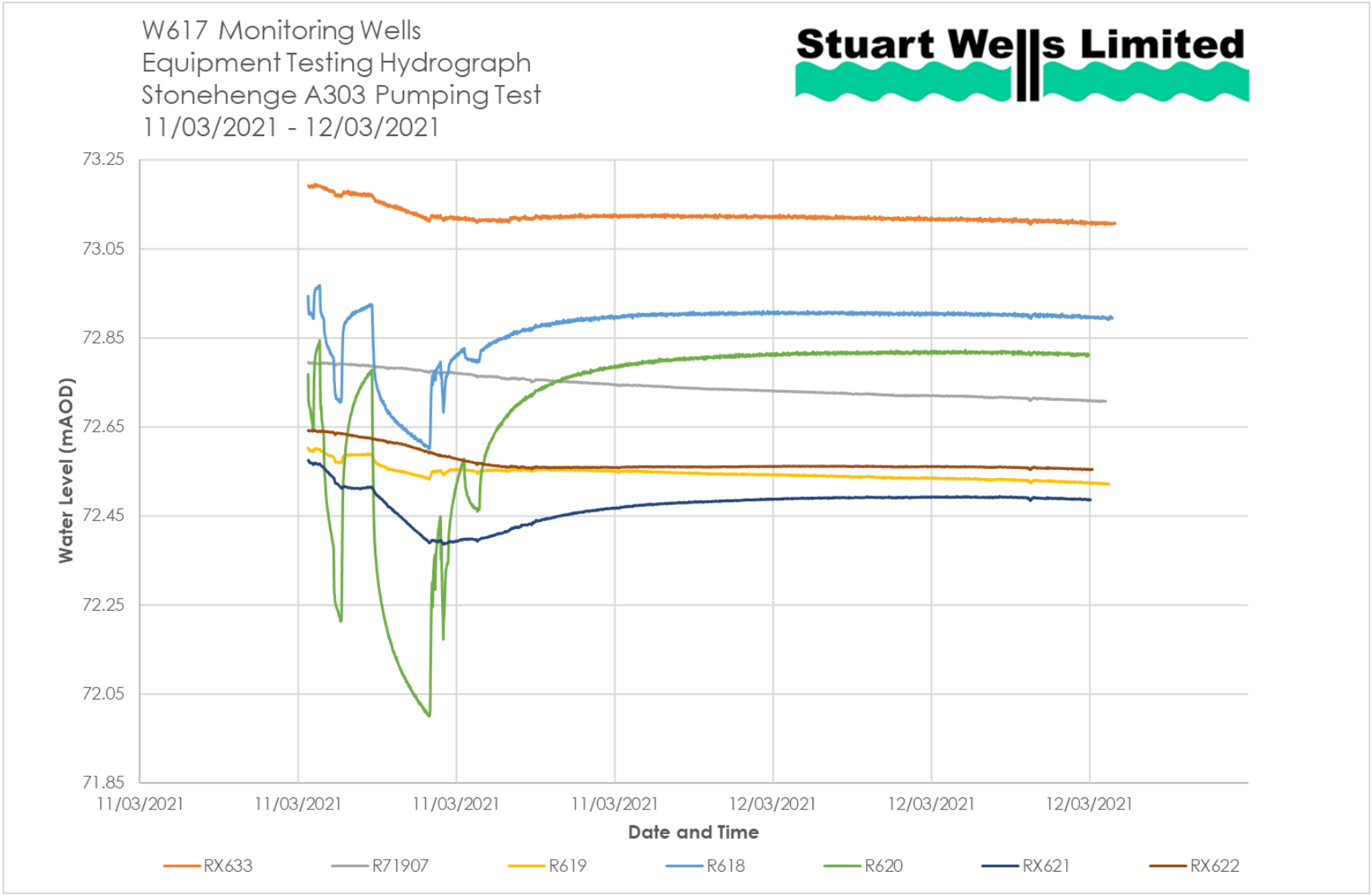



Figure 4: Equipment Test Monitoring Wells Groundwater Level Hydrograph

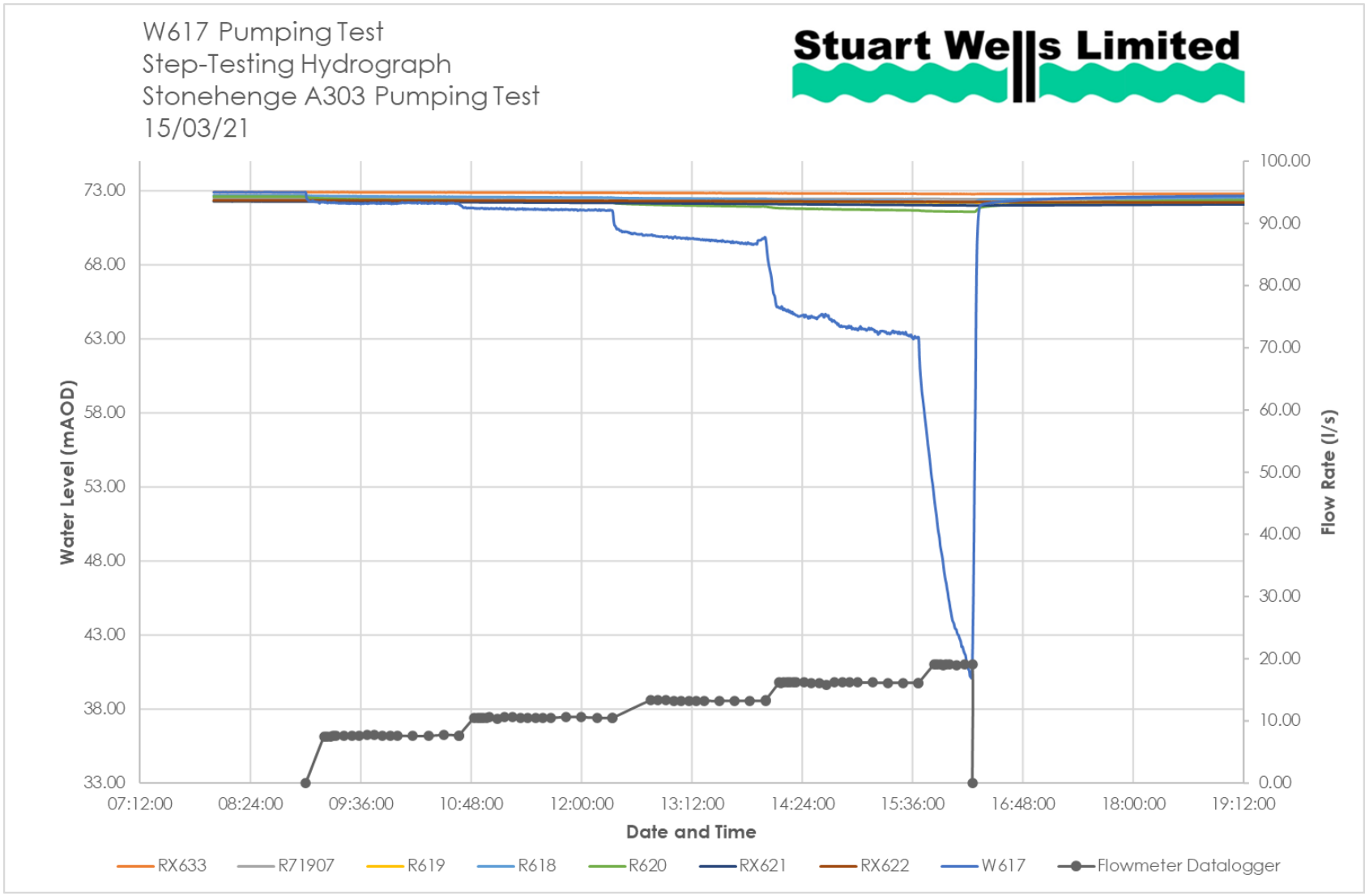



Figure 5 W617 Step-Test Groundwater Level Hydrograph

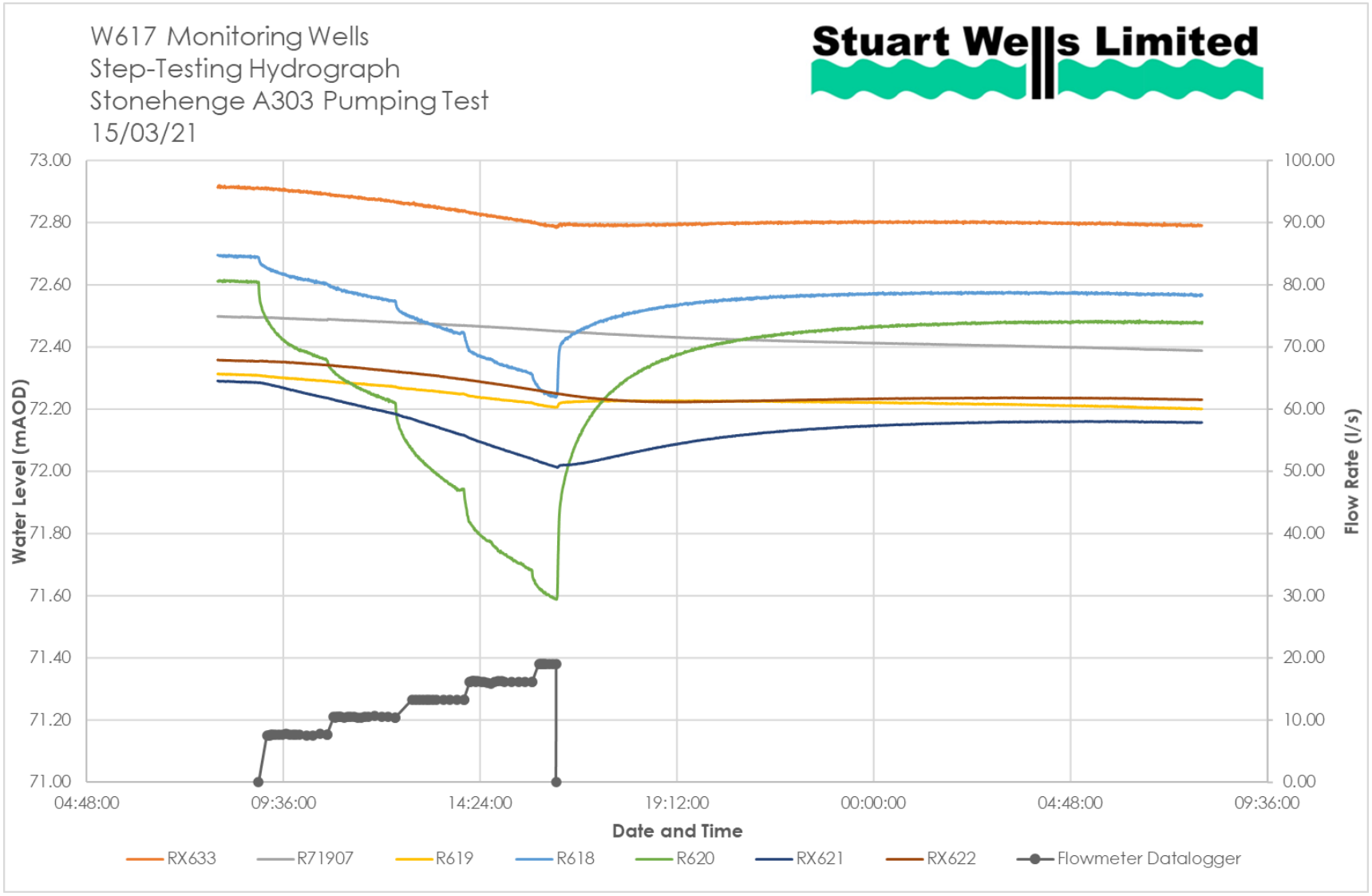



Figure 6 W617 Monitoring Wells Step-Test Groundwater Level Hydrograph

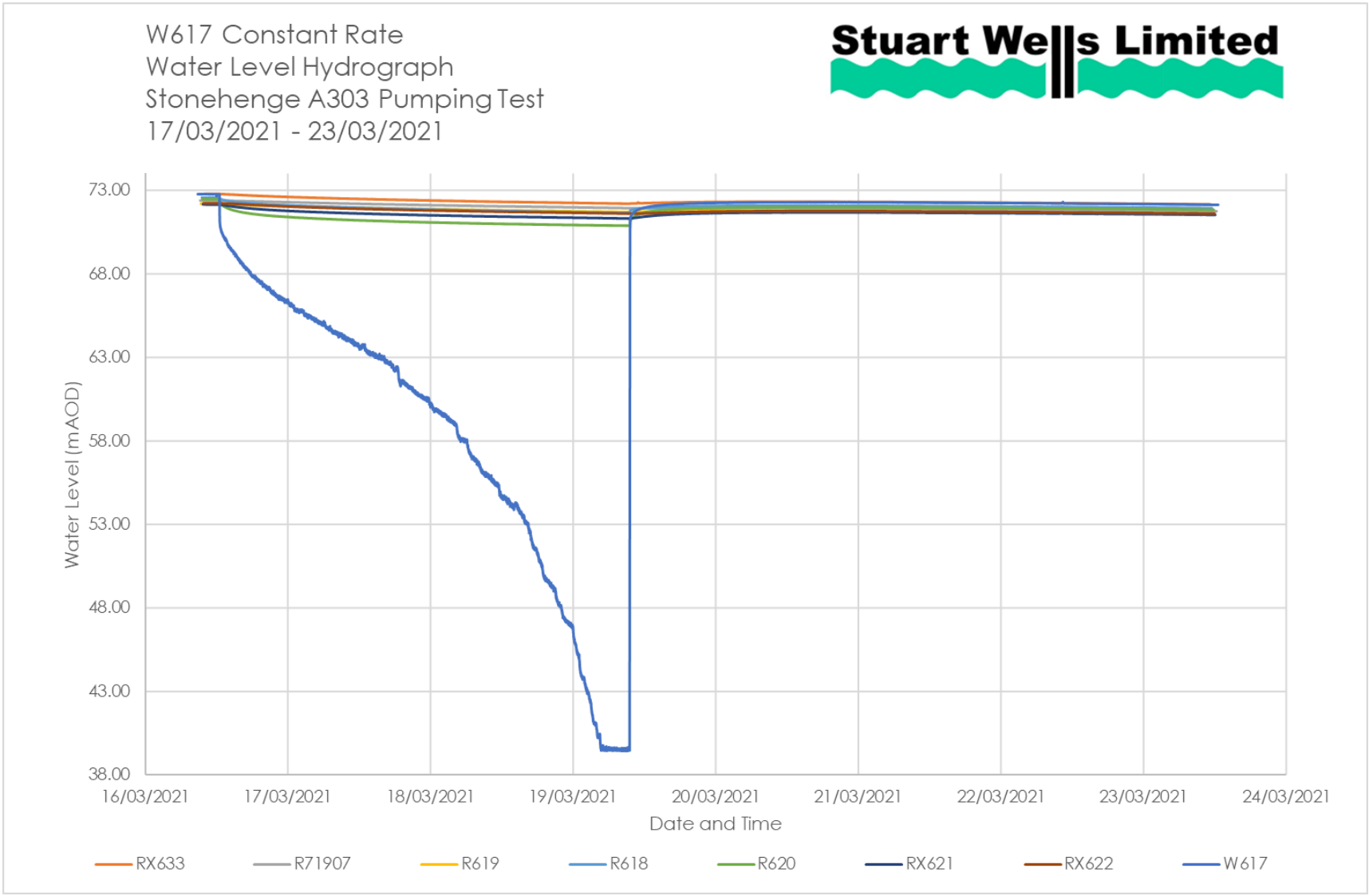



Figure 7 W617 Constant Rate Groundwater Level Hydrograph

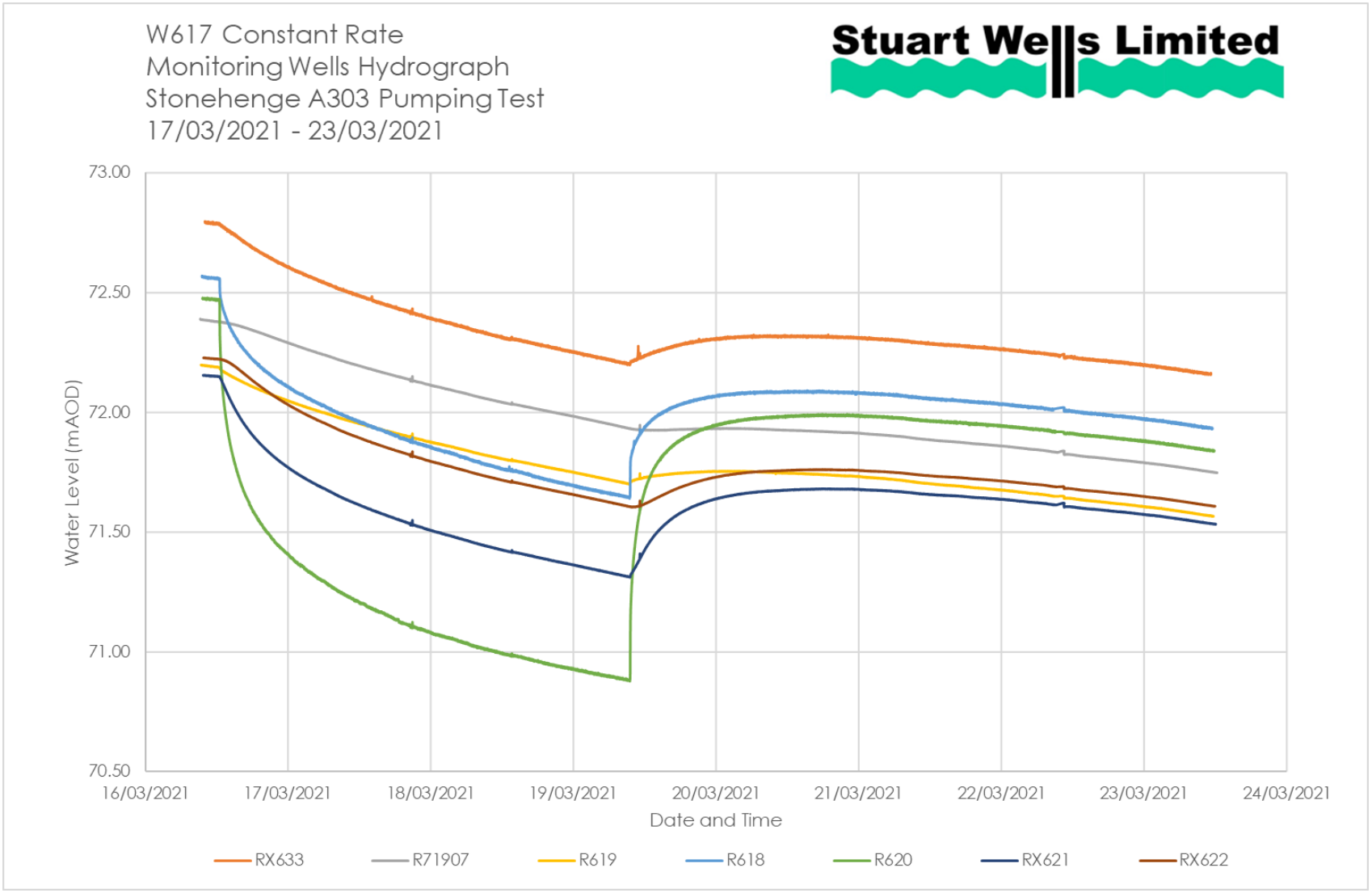



Figure 8 W617 Monitoring Wells Constant Rate Groundwater Level Hydrograph

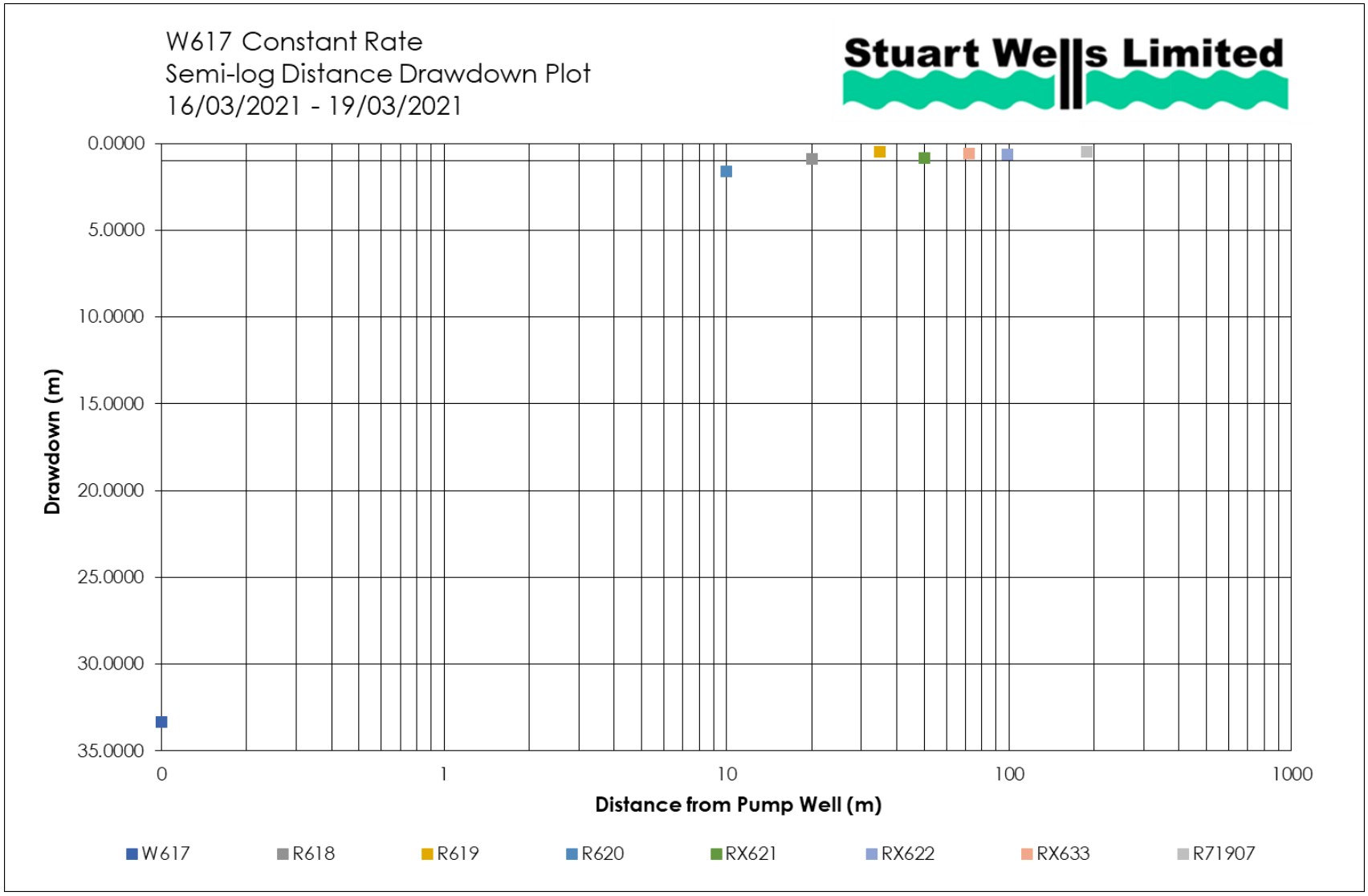



Figure 9 W617 Semi-Log Distance Drawdown Plot

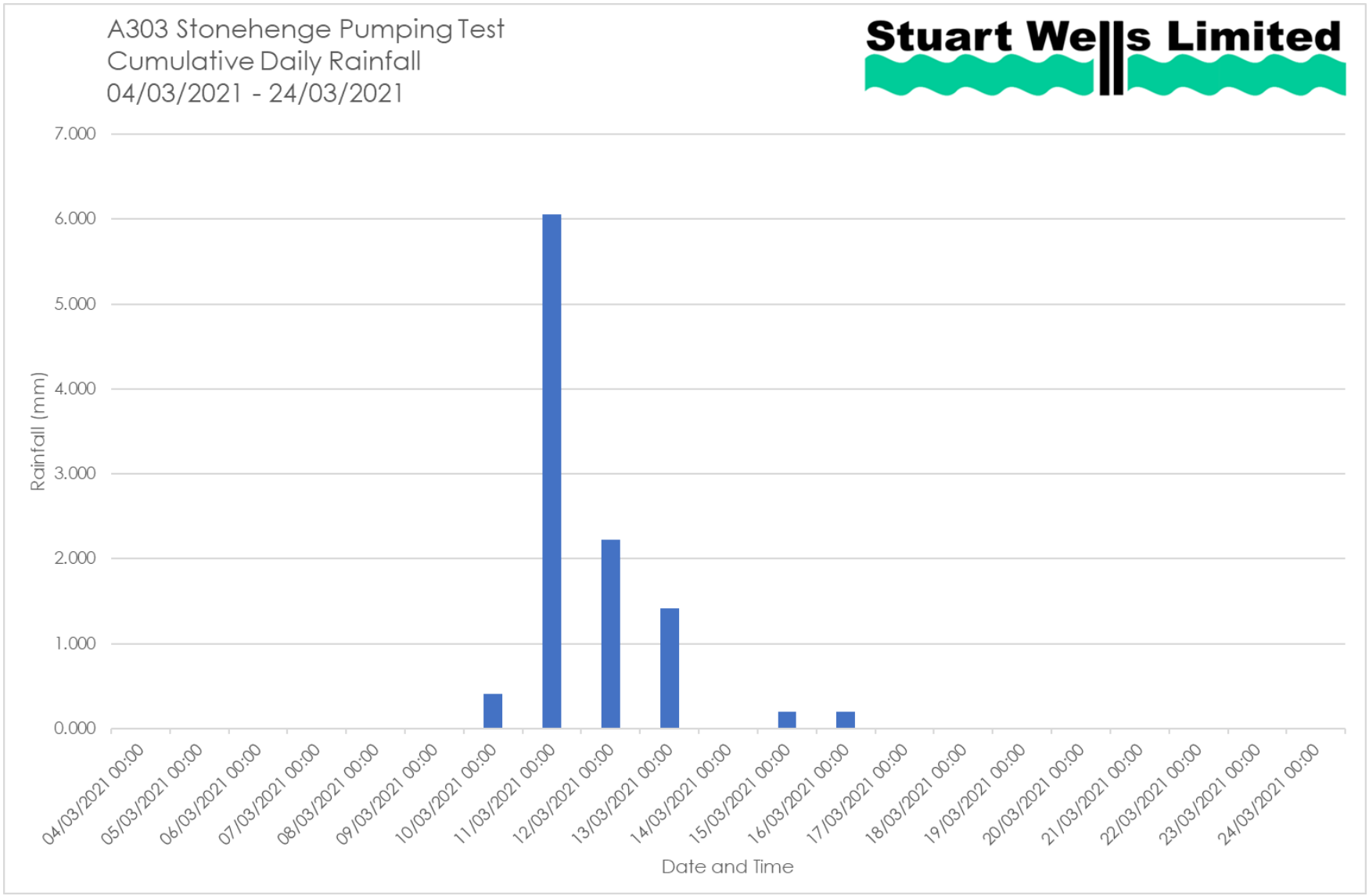



Figure 10 Cumulative Daily Rainfall Graph

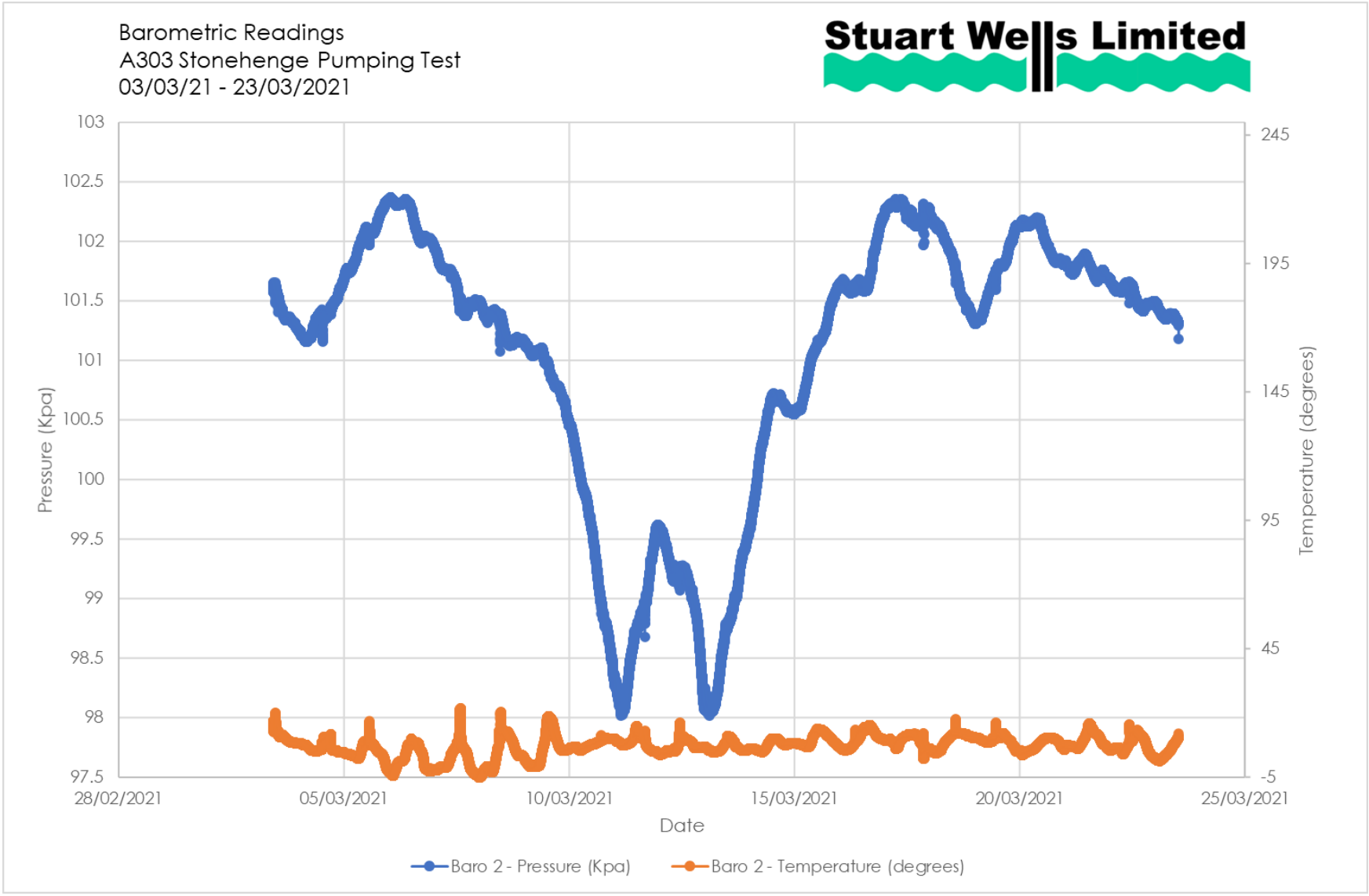



Figure 11 Barometric Graph

# APPENDIX

**Appendix 1: CONSENT TO INVESTIGATE A GROUNDWATER SOURCE SWWGIC097-2**

| Consent No: | SWWGIC097-2 |
|---|---|

# CONSENT TO INVESTIGATE A GROUNDWATER SOURCE

Section 32(3) Water Resources Act 1991

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

Mr Andrew Clark

of Highways England, Bridge House, 1 Walnut Tree Close, Guildford, Surrey GU1 4LZ ("the Consent Holder").

This consent authorises the Consent Holder to abstract water for testing purposes from an existing borehole (W617) at Stonehenge Bottom, Wiltshire, National Grid Reference SU12751 41968

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 31 July 2021

| | |
|---|---|
| Signature [redacted] | Print name<br>Eddie Stevens |
| Position<br>Team Leader Groundwater Hydrology and Contaminated Land | Date<br>22/01/2020 |

This consent is issued by the Environment Agency from its office at Rivers House, Sunrise Business Park, Blandford Forum, Dorset, DT11 8ST. The person whom the Consent Holder should contact during the carrying out of the works and if he has any queries is Ben Hayball, tel. 07825 852437, email Ben.Hayball@environment-agency.gov.uk.

| Consent No: | SWWGIC097-2 |
|---|---|

## 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 person named on the front of this consent by email or post to the address on the front of this consent.

### 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. [redacted]/. 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

No construction of new boreholes is covered by this consent. Pump testing will use existing boreholes for abstraction and monitoring.

### 2. PROGRAMME.

a. The Consent Holder shall carry out test pumping and measurement of water levels in the works and at other points using an equipment test, step test and constant rate test followed by monitoring of recovery of water levels.

b. The constant rate test pumping rates shall not exceed a maximum of 90 $m^3$/hr (25 l/s) unless agreed in writing with the Agency in advance. Equipment test and step tests should not exceed 180 $m^3$/hr (50 l/s) with a maximum duration of 240 minutes and 500 minutes (5 steps of 100 minutes) respectively.

c. Subsequent tests shall not begin until levels in all monitoring boreholes have recovered to within 5% of pre-pumping levels unless agreed in writing with the Agency.

d. Test details (eg: pump rates and durations) may only be varied with prior written agreement from the Agency.

e. The Agency reserves the right to change the requirements for test pumping at any time or instruct that pumping shall cease.

1. **Pre-Test**
   Level monitoring for at least 7 days prior to the start of pumping tests.
2. **Equipment Test**
   Pumping at a range of pump rates for a maximum of 4 hours.
3. **Step Test**
   Five, 100 minute tests at increasing pump rates up to a maximum rate of 180 $m^3$/hr (50 l/s).
4. **Constant Rate Test**
   7 day constant rate test at 90 $m^3$/hr (25 l/s) or such other rate and duration as may be directed by the Agency after completion of the step test.
5. **Recovery Test**
   Level monitoring for a minimum of 24 hours or until levels in all monitoring boreholes have fully recovered, whichever is the longer.

## 3. WATER LEVEL MONITORING

Before, during and after test pumping the Consent Holder is required to monitor the following specified water features.

### 3.1. At the pumped source (W617)

a. The Consent Holder shall measure and record water levels daily for 7 days **before** pumping commences in the pumped borehole. Thereafter the Consent Holder shall measure water levels at a minimum frequency as stated in British Standard BS ISO 14686:2003 from the commencement and completion of each pumping session until water levels have recovered to within 5% of their original level. Discharge rates or meter readings must be recorded at the same frequency as water levels during pumping.

b. Water levels shall be measured relative to an accurately surveyed borehole datum. Where pressure transducers are used they shall be capable of resolving fluctuations in pressure equivalent to 0.01 metres of water or less.

### 3.2. Water Feature Monitoring Points

a. The Consent Holder shall measure and record water levels in the following monitoring boreholes before, during and after the pumping tests at the same frequency as the pumped source:

| | |
| --- | --- |
| R618 | NGR SU 12771 41969 |
| R619 | NGR SU 12786 41969 |
| R620 | NGR SU 12752 41959 |
| R621 | NGR SU 12751 41919 |
| R622 | NGR SU 12750 41870 |
| RX633 | NGR SU 12740 42040 |
| R71907 | NGR SU 12942 41962 |

b. Water levels in boreholes shall be measured relative to an accurately surveyed borehole datum. Where pressure transducers are used they shall be capable of resolving fluctuations in pressure equivalent to 0.01 metres of water or less.

### Submission of Data from Data Loggers

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 in Windows EXCEL format with copies of paper field records where held.

**Any changes to monitoring arrangements must be agreed in writing with the Agency prior to the commencement of testing.**

## 4. DISCHARGE OF WATER

**The pumped water should be disposed of in such a way as to prevent increased risk of flooding or pollution including erosion.**

The Consent Holder

a. shall discharge the abstracted water to the south of grid reference SU 12740 41340 as per the arrangement shown on drawing HE551506-AMW-VGT-SW_GN_000_Z-DR-CE-0001 and subject to conditions outlined above.

b. shall be responsible for appropriate sampling and chemical analysis to ensure pollution is prevented.

**The pumped water should be disposed of in such a way as to prevent re-circulation back to the zone of influence of the test.**

## 5. PUMPING TEST RESULTS

a. The Consent Holder shall provide the Agency with pumping test results and an interpretive report within six weeks of the end of testing. The report shall assess the hydrogeological impact of the tests and implications regarding any future dewatering operations in relation to the A303 Amesbury to Berwick Down Improvement project.

## 6. OTHER SPECIAL CONDITIONS
### 6.1 POLLUTION PREVENTION MEASURES

a. All fuel, oil and chemical storage must be sited on an impervious base within a bunded area. The base and bund walls must be impermeable to the stored material and of an adequate capacity (c110% unless otherwise agreed in writing).

b. The risk of spilling fuel is at its greatest during refuelling of plant. Where possible, refuel mobile plant in a designated area, preferably on an impermeable surface and away from any drains or watercourses. Keep a spill kit available. Never leave a vehicle unattended during refuelling or jam open a delivery valve. Check hoses and valves regularly for signs of wear and ensure they are turned off and securely locked when not in use. Diesel pumps and similar equipment should be place on drip trays to collect minor spillages. These should be checked regularly and any accumulated oil removed for disposal.

c. In the event of a spillage on site, the material should be contained (using an absorbent material such as sand, soil or commercially available booms) and the Agency should be notified immediately on 0800 80 70 60.

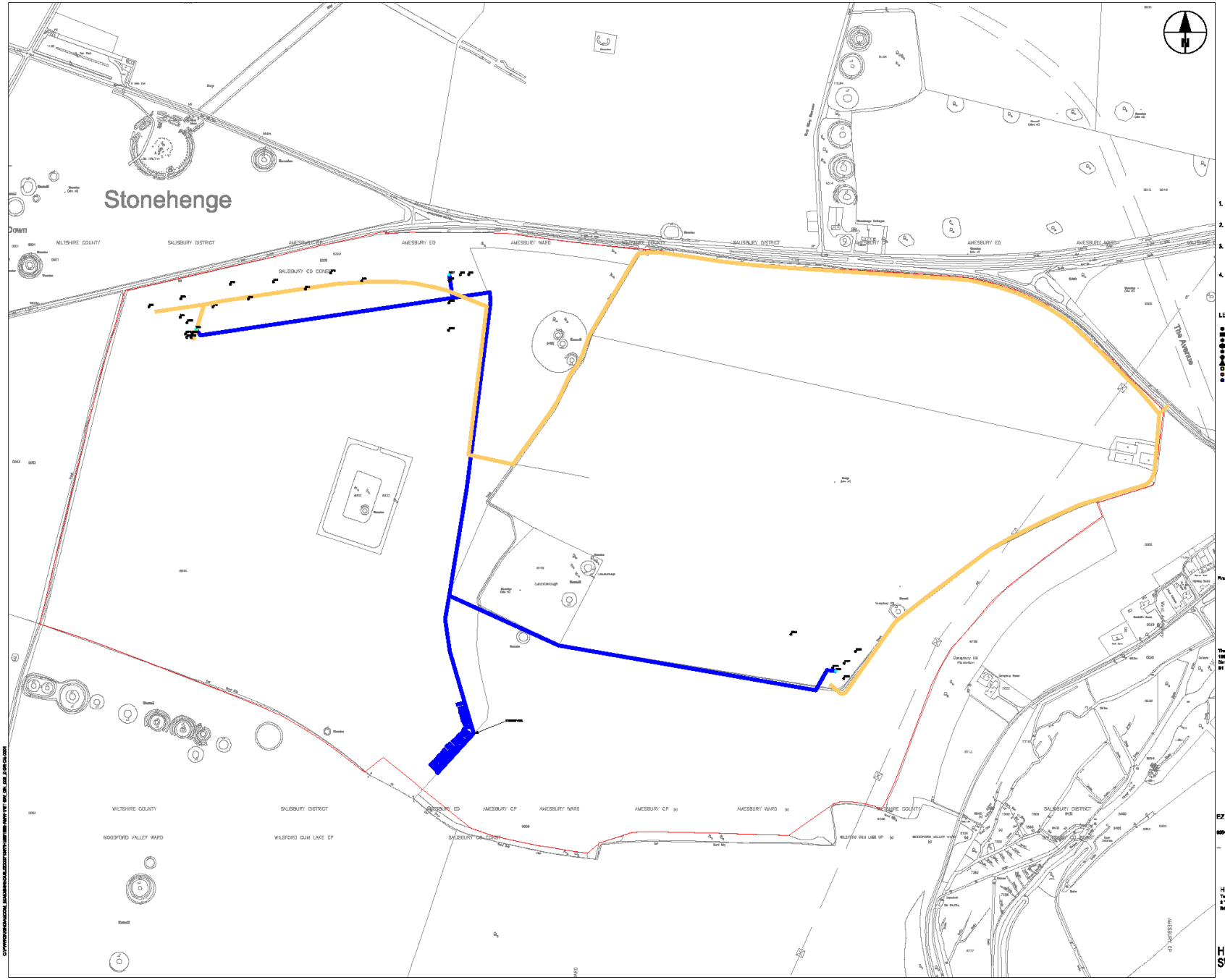
## 6.2 GENERAL

a. Any changes to the testing programme must be agreed in writing with the Agency prior to commencement of testing.

b. The consent holder shall stop the testing of the source at the request of the Agency in response to emergency or unpredicted circumstances.

c. If during the test, the discharge increases the risk of flooding further down the valley, the consent holder shall cease the test and inform the Agency.

d. This Consent does not obviate the necessity for any other separate consents or permissions relating to other aspects of the Agency's activities.


Stonehenge
Down
WILTSHIRE COUNTY
SALISBURY DISTRICT
AMESBURY ED
AMESBURY WARD
SALISBURY CD CONST
The Avenue
WOODFORD VALLEY WARD
WILSFORD CUM LAKE CP
AMESBURY CP
N
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.
LEGEND
RC (Pumping)
RD (Pumping)
PUMPING TEST DISCHARGE PIPES
ACCESS TRACKS
LAND PARCEL BOUNDARIES
0
100m
200m
SCALE 1:3000 @ A1
First issue
OL
EZ
22/12/17
P01
INITIAL STATUS OR WIP
The Cube
199 Wharfside Street
Birmingham
B1 1RN
A303 Stonehenge
Amesbury to Berwick Down
PROPOSED GROUND INVESTIGATION
EZ
OL
OL
EZ
22/12/17
60561439
GD
Richard White
Highways England Project Office
Temple Quay House
2 The Square, Temple Quay
Bristol, BS1 6HA
HE551506 AMW VGT P01
SW_GN_000_Z DR CE 0001

**Appendix 2: Annex D5 From June 2020 HE Spec**

# Annex D5: Pumping test

**General**

The area at Stonehenge Bottom has been identified as a priority for further pump test investigation. It is proposed to conduct a further pump test at this location using the existing pump well (W617) and the surrounding monitoring wells (R618, R619, R620, R621, R622, RX633 and R71907).

- The main objective of this pumping tests is to collect further hydrogeological information in relation to dewatering for the tunnel construction, in particular:
    - The hydraulic properties of the chalk aquifer at greater depth than previously investigated; and
    - The general permeability of the phosphatic chalk south of Stonehenge and the chemistry of the groundwater.

**Industry Standards**

- BS ISO 14686:2003 Hydrometric determinations - Pumping tests for water wells - Considerations and guidelines for design, performance and use (supersedes BS6316:1992);
- BS EN ISO22282-1:2012 Geotechnical investigation and testing - Geohydraulic testing Part 1: General Rules; and
- BS EN ISO22282-1:2012 Geotechnical investigation and testing - Geohydraulic testing Part 4: Pumping tests.

**Borehole Construction: Pumping Wells *Not required for Phase 7B*.**

- The Ground Investigation Contractor shall drill the boreholes at adequate diameters to provide a minimum finished internal bore (plain cased and screened) of at least 250 mm ID. Surface casing of at least 406mm ID shall be used to seal the upper part of the borehole from the ground surface to a minimum depth of 5 m using an adequate grout seal with a minimum annulus of 34mm.
- The Ground Investigation Contractor shall install blank and slotted casing inside of the surface casing in order to provide protection for the pump unit and rising main. The slotted casing will be installed from expected seasonal groundwater high to the base of the hole, to be advised by the Investigation Supervisor, - plain casing will be installed above to ground surface. The exception to this may be at Stonehenge Bottom where at least one length of plain casing may need to be installed from surface in order to grout the casing in place and create an adequate seal.
- The Ground Investigation Contractor shall ensure the slotted casing has sufficient open area and large enough slot size to keep the water entrance velocity low and reduce friction head loss. This is of significant importance in Stonehenge Bottom where flow rates during the seasonal high pumping test may be in excess of 25l/s (based on previous tests). The size of the slot openings, and details of the type and manufacture of the well screen and casing will be submitted the Investigation Supervisor for agreement at least one week prior to the commencement of drilling.
- A filter pack formed of clean, washed, well rounded 2-5 mm silt free gravel will be installed around the slotted casing in order to allow the inner casing to be grouted in place at the surface. The grading of the filter pack will be proposed by the Ground Investigation Contractor and will require the agreement of the Investigation Supervisor. The gravel pack shall be installed to from the bottom of the hole to a minimum of 5 m above the top of the screen.
- Following development of the borehole a 0.5 m thick fine sand blinding layer should be installed above the filter pack. A cement/bentonite grout should be installed above the sand blinding layer to ground surface using a tremie or grout pipe.
- In the eventuality that the ground is found to be competent from surface to the bottom of the hole the Investigation Supervisor may decide to install the pumping well without gravel pack around the casing. In this instance, the Ground Investigation Contractor shall ensure that the

surface casing is properly grouted and remains permanently in place to provide a surface seal and avoid surface water running down the hole.

- The pumping wells will be completed at the surface with a lockable well cap around the headworks to demarcate its locations.
- The steel casing for the headworks shall be terminated approximately 200 mm above ground, and a flange shall be welded to the top of the steel casing. An approximately 300 mm long flanged extension piece with the same diameter as the steel casing shall be fixed to the flange plate. A 10 mm mild steel plate with a 25 mm screwed boss and cap/socket at the centre shall be bolted to the flange complete with a gasket. The cover plate should have a secure dipping access installed.
- The typical design of the pumping wells to be constructed are to TBC. Typical headworks for the pumping boreholes are TBC.
- Drilling muds, additives and foams used shall be degradable and approved (by the Environment Agency) for use in potable water wells. Bentonite shall not be used as a drilling mud for drilling through the Chalk. Water introduced into the well shall be potable water from the public supply.
- Drilling returns, and flush water shall be discharged to a nearby drilling tank (or other appropriate storage vessel). Water and spoil shall be disposed of by an appropriate and approved method. The Ground Investigation Contractor shall obtain all necessary permissions for disposal of all effluents and arisings.

**Well Development (for pump test wells) *Not required for Phase 7B*.**

- The Ground Investigation Contractor shall propose their methodology and equipment for sustaining the above pumping rates for well development and submit their methodology to the Investigation Supervisor no less than one week prior to the commencement of construction of these wells.
- Following completion of drilling, and before installation of the slotted casing, the abstraction wells shall be developed for a minimum of two hours by one of the following methods, to be agreed with the Investigation Supervisor on site 24hrs prior to well development.
    - High pressure water jetting of the open-hole section to remove any disturbed chalk residue;
    - Airlift pumping of the borehole to remove any sediment.
- Following development and prior to installation of the internal slotted casing and filter pack, the Ground Investigation Contractor shall log the borehole using the geophysical methods set out in Annex E5.
- Following installation of the filter pack and slotted casing the borehole should be further developed by alternately surging and pumping to achieve a flow reversal into and out of the well through the screen and filter pack, for a minimum of 1 hour of actual development and until water runs clear of fines. This is intended to dislodge any drilling debris and fine silt particles present.
- Following development, the level of the gravel pack should be checked and topped up if necessary. The annulus will be then backfilled using bentonite pellets or bentonite grout to ensure a sufficient seal from the surface
- Following construction and development of the production well electrical submersible pumps and rigid uPVC dip tubes are to be installed. The uPVC dip tubes will need to be rigid and minimum diameter of 50 mm ID, consisting of slotted and plain lengths. The dip tube should be lowered to approximately 2 meters below the pump intake or the anticipated maximum drawdown level to facilitate groundwater level measurements. The installation depths of the pumps and dip tubes will be confirmed on site with the Investigation Supervisor.

**Borehole Construction: Monitoring Wells *Not required for Phase 7B*.**

- Each location shall have a single 50 mm PVC standpipe comprising of plain casing and screened sections. The screen section shall be installed from a depth relating to the

expected seasonal maximum to the base of the borehole. Plain 50 mm casing will be installed above the screened section to surface including sufficient stick-up.

- Development of the monitoring wells (standpipe piezometers) shall comprise the pumping of at least three well response zone volumes of water, including filter pack volume. The wells should be developed until water runs clear of sediments unless the recharge rate prevents continuous pumping.
- A 2 - 5 mm dorsilit gravel pack shall be installed from the bottom of the hole to a minimum of 5 m above the screened section.
- Following development of the borehole a 0.5 m thick fine sand blinding layer should be installed above the filter pack. A cement/bentonite grout should be then installed above the sand blinding layer to ground surface using a tremie or grout pipe.
- At the surface a lockable well cover will be installed (cemented in place if necessary) which will be of sufficient diameter and depth to install and lock telemetry equipment at the borehole.
- The typical design for the construction of the monitoring wells is presented in Figure 11 as a reference.
- The Ground Investigation Contractor shall ensure that monitoring boreholes are straight and vertical and such that they can allow the proper installation of casings, slotted casings, filter gravel, bentonite/cement grout etc., the carrying out of development, and the functioning of the boreholes for the purpose of measuring of water levels either manually or by transducer/data loggers, and for the procurement of water samples by means of sampling devices or pumping using a Waterra type pump.
- All observation and monitoring wells must be competed a minimum of one week in advance of the pumping tests to allow time for the water levels in the wells and piezometers to stabilise before pump testing.
- On completion of all development activities, and prior to commencement of test pumping, the depth to the base of the borehole shall be recorded by plumbing with a weighted tape or other method to be submitted to and approved by the Investigation Supervisor.

**Preparation for Pumping Tests**

- The Pumping Tests will be carried out in accordance with the Code of Practice for Pump Testing of Water Wells, BS ISO 14686:2003.
- The Ground Investigation Contractor shall test their proposed pumping equipment for a range of pumping rates sufficient for the Investigation Supervisor to determine the five step flow rates for the full-scale pumping tests. The Ground Investigation Contractor shall submit their test findings to the Investigation Supervisor no less than 24hrs prior to commencement of the full-scale pumping tests.
- The Contractor shall provide at least two methods of measuring discharge during test pumping. At least one method shall provide an accurate measurement of instantaneous discharge, such as a digital in-line integrating flow meter or an electronic accumulating measure, while the second method shall either be a V-notch weir or an orifice plate and manometer assembly. A second in-line system must be brought as a backup. The equipment shall also provide a visual reference for suspended materials in the pumped water during well development.
- The arrangement of the pumping equipment should be such to include for a sample tap installed between the pump and the flow control valve. The sample tap should be placed so that there is a minimum of 500 mm below the sample tap to enable a sample contained to be filled.
- The pump and rising main must be fitted with a non-return valve to ensure no water flow back into the bore when the pump is turned off.
- The Ground Investigation Contractor shall provide the following monitoring data for no less than 7 days in advance of and for the duration of the pumping tests:
    - Borehole water levels;

- Barometric (atmospheric) pressure measured on site or data procured from the Meteorological Office if a suitable local recording station is available;
- Rainfall data, this may be procured where local Meteorological Office data is available or via a rain gauge set up and managed by the Ground Investigation Contractor within the catchment; and
- Local river flow data (for the River Avon), this may be procured where the Environment Agency has local data available, or via a level sensor set up and managed by the Ground Investigation Contractor.

- The data shall be provided at the same time as the pumping test reports.

**Equipment Testing**

- The Contractor shall provide a test pump of a type and dimensions such that it can be accommodated within 200 mm internal diameter casing and capable of discharging at up to 180 $m^3$/hr (50 l/s) against a head of up to 50 m. The contractor should also provide a smaller test pump capable of discharging at up to 36 m3/hr (10 l/s) in case higher pumping rates are not achievable.
- After completion of all construction, development and cleaning activities a test pump shall be run in the hole and all equipment required for a pumping test set up. The pump should be run at different rates for up to 4 hours in total, to test all the equipment and to determine the range of flow rates to be maintained during the step-drawdown test. The equipment settings required to achieve the pumping rates shall be recorded so that the step-drawdown and constant rate tests may be carried out efficiently and correctly.
- The Ground Investigation Contractor shall ensure that water levels have recovered overnight prior to undertaking any further pumping.

**Undertaking Pumping Tests**

- The raw data from the pumping tests shall be submitted to the Investigation Supervisor on site and as part of their factual reporting submission.
- Groundwater levels shall be measured at the abstraction well and the five nearby monitoring standpipes. Levels at all locations will be monitored continuously by pressure transducers and data loggers, which shall be installed by the Ground Investigation Contractor. The depths to which the loggers are installed shall be agreed with the Investigation Supervisor. Any failure of loggers is at the Ground Investigation Contractor's risk and may require work to be repeated should data be lost or not recorded. The loggers shall be set to a frequency which meets the requirements of data collection as set out in BS 14686 2003 Hydrometric determinations Pumping tests for water wells — Considerations and guidelines for design, performance and use and agreed with the investigation supervisor.
- The time on all loggers must be synchronised and must be set to GMT time to avoid previously encountered problems with summer/winter time change. The use of a barometric pressure logger for atmospheric pressure correction is also required.
- The Contractor must supply sufficient pressure transducer and manual water level dipper to monitor water levels simultaneously in 6 boreholes. The contractor shall provide enough personnel to take manual readings at each monitoring boreholes according to BS standards during the Step Test, the first 300 mins of the constant rate test and the first 300 minutes of recovery.
- During the pumping test the Ground Investigation Contractor will take manual water level readings (and calculated drawdowns) and check abstraction rates at the following intervals:

One dip just before the commencement of the test

| Time since pumping started/stopped | Time between measurements |
|---|---|
| 0 to 10 mins: | every 1 minute |
| 10 to 20 mins: | every 2 minutes |
| 20 to 60 mins: | every 5 minutes |
| 60 to 100 mins: | every 10 minutes |

| | |
|---|---|
| 100 to 300 mins: | every 20 minutes |
| 300 to 1000 mins: | every 50 minutes |
| 1000 to 3000 mins: | every 100 minutes |
| 3000 mins to the end of test | every 200 minutes |

- The Contractor shall ensure that there are a sufficient number of electric dippers on site, in working order, to undertake the monitoring of water levels required by the specification. Dippers shall have a minimum length of tape of 100 m with centimetre and metre graduations. The time measurements should be taken to the nearest second during the first ten minutes of the constant rate test, and to the nearest 30 seconds for the remainder of the tests.
- During the pumping tests, the following records will be produced by the Ground Investigation Contractor:
- Daily record sheet of work done on each day; and
- Daily records of pumping test flow and manual dip results in digital format.
- Groundwater flow monitoring shall be undertaken during testing at the same frequency as the water level measurements. The flow meter instrumentation shall be capable of providing instantaneous and totaliser volumes.
- Discharge shall be maintained to within 10% of the rate ordered by the Investigation Supervisor.
- All flow meters used must be appropriately rated for the flow rates (i.e. a high flow meter must not be used in low flow situations as this will result in inaccurate flow measurements). The accuracy of the flow meter must be established during the pump calibration.
- The raw data shall be issued in Excel® format including, but not limited to elapsed and clock time, flow rate, data logger continual water level readings, manual dip readings and calculated drawdowns.

**Step Drawdown Test**

- A step test shall be undertaken prior to undertaking the constant rate test. The test shall be undertaken continuously and consist of five 100 minute steps. The pumping rates shall be approximately 40%, 60%, 80%, 100% and 120% of the maximum flow rate determined from the equipment test. The test shall be conducted in increasing flow increments so that the final step is the maximum tested flow. The flow rates shall be agreed with the Investigation Supervisor prior to undertaking the step test.
- The discharge rate shall be measured during the test at the same interval as required for groundwater level monitoring. Instantaneous and totaliser readings must be taken at the beginning and end of each step.
- Following completion of the test water level recovery monitoring shall be undertaken. The Ground Investigation Contractor shall ensure that water levels have recovered fully prior to undertaking the constant rate discharge test.

**Constant rate discharge test**

- The duration of each constant rate test shall be 7 days actual pumping. During the test, the abstraction well shall be pumped continuously and at a constant rate as determined from the results of the step-drawdown test. The abstraction rate shall be determined by the Ground Investigation Contractor and agreed by the Investigation Supervisor. The pumping rate shall not vary by more than 10% throughout the duration of the test. Persistent fluctuations beyond this tolerance will require abortion of the test, for which payment shall not be made. The pumping unit shall be capable of being operated without interruption for a minimum period of 24 hours. Water recovery measurements will be made immediately after switching off the test pump until the water level recovers to 95% its original level.
- Flow measurement shall be done manually by 90-degree vee notch set in a levelled weir tank together with a recording digital flow meter properly positioned in the discharge line. Groundwater flow monitoring shall be undertaken during testing at the same frequency as the water level measurements.

- Field meters shall be used to measure the pH, specific conductivity (µS/cm) and temperature of the water. Measurements shall be taken at hourly intervals for the first 12 hours followed by twice daily for the remainder of the test. All meters must be calibrated daily.
- Two groundwater samples shall be collected during the test, at 1 hour, and at the end of the test. The groundwater samples shall be taken at the wellhead by the Investigation Supervisor or the Ground Investigation Contractor. Both should be trained to carry out the groundwater sampling. The sample should be kept in a refrigerated container and given to the Investigation Supervisor as soon as possible. The samples will be sent to an accredited laboratory to be tested for the chemical parameters outlined in Schedule 2 (Suite F2).

**Recovery Test**

- Water recovery measurements will be made immediately after switching off the test pump until the water levels in each of the monitoring wells have recovered to 5% of their pre-test levels (a minimum of 24 hours). Monitoring frequency shall be as set s set out in BS 14686 2003 Hydrometric determinations Pumping tests for water wells — Considerations and guidelines for design, performance and use and agreed with the investigation supervisor.

**Interruption to tests**

- If the pump breaks down during the first 24 hours of the constant rate test, or if the test is aborted for more than 30 minutes thereafter, or if the flow rate has varied by 10% from the rate at which the test was started the test shall be aborted and the water levels in the abstraction well left to recover to within 0.1m of the rest water level at the start of the test. The test shall then be started again. No payment shall be made for aborted tests or for standing time during water level recovery after aborted tests.
- Replacement measurement equipment shall also be made available. Any malfunctioning of equipment shall be considered as equal to pump failure and if not solved in reasonable time the tests may need to be started over. This decision will be made with the agreement of the Investigation Supervisor.
- Any test that has been interrupted during the first 24 hours, or for more than 30 minutes thereafter, or in which the flow rate has varied by 10% from the rate at which the test was started, shall be aborted and restarted as in the first paragraph above.

**Disposal of pumped waters**

- The selected discharge point should ensure that any waste water is discharged downstream and outside the zone of influence of the pumping test and does not hydraulically interfere with the test. It should also not increase risk of flooding or pollution or cause erosion, degradation of vegetation and/or damage to local infrastructure.
- Should it be required to discharge water to a surface water coarse of ground water as and agreed point away from the test a discharge licence will need to be obtained prior to testes starting.Water should be discharged
- The Ground Investigation Contractor shall supply and shall maintain all necessary pipework or fully lined channels for the conveyance of the water discharge from the borehole to a discharged point specified above or as otherwise directed by the Investigation Supervisor. The Ground Investigation Contractor shall ensure that all pipelines are watertight, sufficient for the discharges to be pumped, and secure against tampering by vandals.

**Reporting**

- Ground Investigation Contractor to submit factual report containing well construction details, details of all equipment used during the pumping test including calibration certificates, original and fair copies of field recording sheets, electronic data in Excel format both raw and corrected showing clock time and elapsed time, water levels, depth to water and calculated drawdowns, flow rates and water quality fields measurements.

**Appendix 3: R618 Borehole Log**

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 1 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |
| | | | | | | | | | | Brown slightly gravelly sandy SILT. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of chalk and flint. | | 79.21 | (0.30) 0.30 | |
| 0.50 | | | | | | 101 | ES | | | Cream and pale brown structureless CHALK comprising slightly sandy gravelly SILT with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of chalk and rare flint. Cobbles are subangular to subrounded chalk and rare flint. (Grade Dm) | | 78.81 | (0.40) 0.70 | |
| | | | | | | | | | | White and cream structureless CHALK comprising slightly sandy silty angular to subrounded fine to coarse GRAVEL of chalk and rare flint. Sand is fine to coarse. (Grade Dc) | | 78.31 | (0.50) 1.20 | |
| 1.20-2.20 (0:07) | 80% return Air+Mist (White) | 30 | 0 | 0 | | | | | | Brown sandy silty angular to subrounded GRAVEL with high cobble content of flint. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint and chalk. (Possible Superficial). | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 01/05/18 | 18:00 | 1.20 | 1.35 | N/R | Dry |
| 03/05/18 | 08:00 | 1.20 | 1.35 | N/R | Dry |
| 03/05/18 | 17:25 | 9.70 | 1.35 | 146 | 6.10 |
| 04/05/18 | 09:20 | 9.70 | 1.35 | 146 | 6.04 |
| 04/05/18 | 13:40 | 12.70 | 9.00 | 146 | 5.44 |
| 08/05/18 | 11:00 | 12.70 | 9.00 | 146 | 6.01 |
| 08/05/18 | 17:00 | 36.70 | 9.00 | 146 | 5.40 |
| 09/05/18 | 09:10 | 36.70 | 9.00 | 146 | 6.01 |

## General Remarks

1. Location CAT scanned prior to excavation.
2. First strata encountered excavated by Archaeologists.
3. Hand dug inspection pit to 1.20m depth on 26/03/2018.
4. No groundwater strikes noted by the driller.
5. Borehole drilled using a 146mm geobore S core barrel and air mist as the flush medium.
6. 50mm PVC groundwater monitoring pipe installed as shown.

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **R618** |

| Contract Ref: | Start: **01.05.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **10.05.18** | **79.51** | **E:412770.9 N:141968.9** | **2** of **46** |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80% return Air+Mist (White) | 30 | 0 | 0 | | | | | | Brown sandy silty angular to subrounded GRAVEL with high cobble content of flint. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint and chalk. (Possible Superficial). *(stratum copied from 1.20m from* previous sheet) | | | (1.75) | |
| 2.20-2.95 (0:04) | | | | | | | | | | | | | | |
| | 80% return Air+Mist (White) | 33 | 0 | 0 | | | | | | | | | | |
| 2.95-3.70 (0:04) | | | | | | | | | | | | 76.56 | 2.95 | |
| | 80% return Air+Mist (White) | 67 | 0 | 0 | | | | | | Structureless CHALK composed of slightly sandy silty GRAVEL of white chalk. (Grade Dc) | | | (0.75) | |
| 3.40-3.50 | | | | | | 5 | D | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 09/05/18 | 13:00 | 48.70 | 9.00 | 146 | 5.45 |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Beretta T.51** | **???** | **IFoster + BSaimen** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 3 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80% return Air+Mist (White) | 67 | 0 | 0 | | | | | | Structureless CHALK composed of slightly sandy silty GRAVEL of white chalk. (Grade Dc) *(stratum copied from 2.95m from previous sheet)* | | 75.81 | 3.70 | |
| 3.70-4.20 (0:03) | | | | | | | | | | Assumed zone of core loss. | | | | |
| | 80% return Air+Mist (White) | 0 | 0 | 0 | | | | | | | | | (1.00) | AZCL |
| 4.20-4.70 (0:03) | | | | | | | | | | | | | | |
| | 80% return Air+Mist (White) | 0 | 0 | 0 | | | | | | | | 74.81 | 4.70 | |
| 4.70-5.20 (0:03) | | | | | | | | | | Very weak medium density white slightly brown stained CHALK. Fracture set 1: Fractures are 55-66° closely spaced open undulating rough with brown staining (100/150/200). Fracture set 2: Fractures are 80-85° closely spaced partly open with light brown staining (60/110/245). Single fracture at 4.83m 20° undulating rough moderately wide infilled with fine to medium fragments of chalk. (Grade C4) | 1[i] 2[i] 3[i] 4[i] 5[i] 6[i] | | | |
| 4.90-5.00 | 80% return Air+Mist (White) | 100 | 0 | 0 | | 6 | D | | | | | | (0.50) | |
| | | | | | | | | | | | | 74.31 | 5.20 | |
| 5.20-5.95 (0:04) | 80% return Air+Mist (White) | 67 | 0 | 0 | | | | | | Very weak medium density white CHALK recovered as angular gravel and cobble sized chalk. | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 4 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Very weak medium density white CHALK recovered as angular gravel and cobble sized chalk. *(stratum copied from 5.20m from* previous sheet) | | | | |
| | 80% return Air+Mist (White) | 67 | 0 | 0 | | | | | | | | | | |
| 5.80-5.95 | | | | | | 7 | D | | | | | | | |
| 5.95-6.65 (0:04) | | | | | | | | | | | | | | |
| | 80% return Air+Mist (White) | 71 | 0 | 0 | | | | | | | | | | |
| 6.35-6.45 | | | | | | 8 | D | | | | | | | |
| 6.65-7.45 (0:04) | | | | | | | | | | . . . between 6.65m and 6.74m small rinded flint. | | | (3.00) | |
| | 80% return Air+Mist (White) | 38 | 0 | 0 | | | | | | | | | | |
| 7.45-8.20 | | 53 | 0 | 0 | | | | | | . . . at 7.45m small rinded flint. | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 5 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (0:04) | | | | | | | | | | Very weak medium density white CHALK recovered as angular gravel and cobble sized chalk. *(stratum copied from 5.20m from* previous sheet) | | | | |
| 7.85-8.10 | 80% return Air+Mist (White) | 53 | 0 | 0 | | 9 | D | | | | | | | |
| | | | | | | | | | | | | 71.31 | 8.20 | |
| 8.20-9.70 (0:05) | | | | | | | | | | Very weak medium density white slightly brown stained CHALK. Fracture set 1: Fractures are 20° closely spaced undulating rough partly open to open with rare fine chalk infill and brown staining/light black specks (20/100/630). Fracture set 2: Fractures are 45-65° closely spaced planar rough partly open to open clean rarely infilled with fine chalk and light brown staining/light black specks (40/65/165). Single fracture at 8.92m 85° undulating rough partly open with light brown staining. (Grade C4) | | | | |
| 8.70-8.90 | | | | | | 10 | D | | | | | | | |
| | 80% return Air+Mist (White) | 60 | 6 | 0 | NI NI 120 | | | | | | 7[i] 8 9[i] 10[i] 11 12[i] | | | |
| 9.30-9.50 | | | | | | 11 | D | | | | 13[i] 14[i] | | | |
| | | | | | | | | | | . . . at 9.40m very small rinded fragments of flint. | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 6 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80% return Air+Mist (White) | 60 | 6 | 0 | | | | | | Very weak medium density white slightly brown stained CHALK. Fracture set 1: Fractures are 20° closely spaced undulating rough partly open to open with rare fine chalk infill and brown staining/light black specks (20/100/630). Fracture set 2: Fractures are 45-65° closely spaced planar rough partly open to open clean rarely infilled with fine chalk and light brown staining/light black specks (40/65/165). Single fracture at 8.92m 85° undulating rough partly open with light brown staining. (Grade C4) *(stratum copied from 8.20m from* previous sheet) | 15[i] | | | |
| 9.70-10.45 (0:03) | 100% return Air+Mist (White) | 53 | 0 | 0 | NI NI 120 | | | | | . . . at 9.65m occasional brown stained sponges. . . . between 9.70m and 10.45m non intact recovered as angular fine to coarse chalk. | | | (3.00) | |
| 10.45-11.20 (0:04) | | | | | | | | | | . . . at 10.45m and 10.66m possible flint band recovered as angular fine to coarse gravel sized flint. | | | | |
| 10.65-10.80 | | | | | | 12 | D | | | | | | | |
| | 100% return Air+Mist (White) | 93 | 13 | 0 | | | | | | . . . at 10.80m and 10.92m non intact recovered as angular fine to coarse gravel embedded in communited chalk. . . . at 10.96m and 11.05m non intact recovered as angular fine to coarse gravel. | | 68.31 | 11.20 | |
| 11.20-11.95 (0:05) | 100% return Air+Mist (White) | 40 | 0 | 0 | NI | | | | | Very weak to weak medium to high density white CHALK recovered as angular fine to coarse gravel sized chalk. | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Inspection pit + Rotary Cored | Plant Used: | Beretta T.51 | Drilled By: | ??? | Logged By: | IFoster + BSaimen | Checked By: |
|---|---|---|---|---|---|---|---|---|

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 7 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11.50-11.65 | 100% return Air+Mist (White) | 40 | 0 | 0 | NI | 13 | D | | | Very weak to weak medium to high density white CHALK recovered as angular fine to coarse gravel sized chalk. *(stratum copied from 11.20m from* previous sheet) | | 67.56 | (0.75) | |
| 11.95-12.70 (0:05) | 100% return Air+Mist (White) | 47 | 25 | 23 | | | | | | Weak high density white black specks CHALK. Fracture set 1: Bedding fractures are 10-15° closely to medium spaced undulating rough open infilled with comminuted chalk or light brown staining (30/100/340). Fracture set 2: Fractures are 50-55° medium spaced planar rough tight to open clean with rare fine chalk infill and light brown staining (250/450/1410). Fracture set 3: Fractures are 70-85° undulating rough tight to open clean with black specks and rare comminuted chalk infill. Single fracture at 13.47m 25° planar rough partly open clean with black specks. (Grade C3) | 16[i] | | 11.95 | |
| 12.50-12.70 | | | | | | 14 | D | | | | | | | |
| 12.70-14.20 (0:06) | | | | | NI 80 240 | | | | | | | | | |
| 13.00-13.20 | 100% return Air+Mist (White) | 87 | 16 | 7 | | 15 | D | | | . . . at 13.00m small rinded flint. | 17[i] | | (2.25) | |
| | | | | | | | | | | . . . at 13.30m very small rinded nodular flint up to 30mm. | 18[i] 19[i] 20[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 8 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14.00-14.20 | 100% return Air+Mist (White) | 87 | 16 | 7 | NI 80 240 | 16 | D | | | Weak high density white black specks CHALK. Fracture set 1: Bedding fractures are 10-15° closely to medium spaced undulating rough open infilled with comminuted chalk or light brown staining (30/100/340). Fracture set 2: Fractures are 50-55° medium spaced planar rough tight to open clean with rare fine chalk infill and light brown staining (250/450/1410). Fracture set 3: Fractures are 70-85° undulating rough tight to open clean with black specks and rare comminuted chalk infill. Single fracture at 13.47m 25° planar rough partly open clean with black specks. (Grade C3) *(stratum copied from 11.95m from* previous sheet) | 21[i] 22[i] 23[i] 24[i] 25[i] 26[i] | | | |
| 14.20-15.70 (0:07) | 100% return Air+Mist (White) | 93 | 28 | 7 | NI 120 300 | | | | | Weak high density white slightly black specks CHALK. Fracture set 1: Fractures are 10-30° closely and widely spaced undulating rough partly open clean with rare black specks and fine chalk infill (30/80/1470). Fracture set 2: Fractures are 45-60° closely to medium spaced undulating rough partly open to open clean with occasional light brown staining/black specks and rare fine chalk infill (30/150/900). (Grade B3) | 27[i] 28[i] 29[i] 30[i] 31[i] 32[i] 33[i] 34[i] 35[i] 36[i] 37[i] 38[i] | 65.31 | 14.20 | |
| 15.00-15.10 | | | | | | 17 | D | | | | | | | |
| 15.40-15.60 | | | | | | 18 | D | | | . . . at 15.10m and 15.24m non intact recovered as angular fine to coarse gravel sized fragments of chalk. | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 9 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (White) | 93 | 28 | 7 | | | | | | Weak high density white slightly black specks CHALK. Fracture set 1: Fractures are 10-30° closely and widely spaced undulating rough partly open clean with rare black specks and fine chalk infill (30/80/1470). Fracture set 2: Fractures are 45-60° closely to medium spaced undulating rough partly open to open clean with occasional light brown staining/black specks and rare fine chalk infill (30/150/900). (Grade B3) *(stratum copied from 14.20m from* previous sheet) | 39[i] | | | |
| 15.70-17.20 (0:06) | | | | | | | | | | | | | | |
| 16.10-16.30 | | | | | | 19 | D | | | . . . between 16.04m and 16.15m medium fragments of flint (possible flint band) up to 100mm. | 40[i] | | | |
| | 100% return Air+Mist (White) | 90 | 22 | 7 | NI 120 300 | | | | | | 41[i] | | | |
| | | | | | | | | | | | 42[i] | | | |
| | | | | | | | | | | | 43[i] | | | |
| 17.00-17.20 | | | | | | 20 | D | | | | | | (5.80) | |
| 17.20-18.70 (0:06) | 100% return Air+Mist (Brown) | 96 | 27 | 9 | | | | | | . . . at 17.20m and 17.47m non intact recovered as angular fine to coarse gravel sized fragments of chalk. | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Inspection pit + Rotary Cored | Plant Used: | Beretta T.51 | Drilled By: | ??? | Logged By: | IFoster + BSaimen | Checked By: |
|---|---|---|---|---|---|---|---|---|

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 10 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.55-17.75 | 100% return Air+Mist (Brown) | 96 | 27 | 9 | NI 120 300 | 21 | D | | | Weak high density white slightly black specks CHALK. Fracture set 1: Fractures are 10-30° closely and widely spaced undulating rough partly open clean with rare black specks and fine chalk infill (30/80/1470). Fracture set 2: Fractures are 45-60° closely to medium spaced undulating rough partly open to open clean with occasional light brown staining/black specks and rare fine chalk infill (30/150/900). (Grade B3) *(stratum copied from 14.20m from* previous sheet) . . . between 17.95m and 18.13m non intact recovered as angular fine to coarse crushed fragments of chalk. | 44[i] | | | |
| | | | | | | | | | | . . . at 18.00m very small rinded flint. | 45[i] | | | |
| | | | | | | | | | | | 46[i] | | | |
| 18.40-18.50 | | | | | | 22 | D | | | . . . between 18.40m and 18.48m non intact recovered as angular fine to coarse fragments of chalk. | | | | |
| | | | | | | | | | | | 47[i] | | | |
| 18.70-20.20 (0:08) | 100% return Air+Mist (White) | | | | | | | | | | | | | |
| 19.35-19.70 | | | | | | 23 | U | | | | | | | |

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_018 PrjVersion: v8_06 - Core+Full Bristol SI - 012 | Log XCUSTOM - 733442 LOG - A4P | 733442_A3003_STONEHENGE_PHASE_6_GROUND_INVESTIGATION.GPJ - v8_06.
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk. | 08/08/18 - 12:40 | KJ2 |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 11 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (White) | | | | NI 120 300 | | | | | Weak high density white slightly black specks CHALK. Fracture set 1: Fractures are 10-30° closely and widely spaced undulating rough partly open clean with rare black specks and fine chalk infill (30/80/1470). Fracture set 2: Fractures are 45-60° closely to medium spaced undulating rough partly open to open clean with occasional light brown staining/black specks and rare fine chalk infill (30/150/900). (Grade B3) | | 59.51 | 20.00 | |
| | | | | | | | | | | *(stratum copied from 14.20m from previous sheet)* Weak high density white with black specks CHALK. Fracture set 1: Fractures are 5-20° medium spaced planar to undulating rough clean with occasional black specks (80/300/1620). Fracture set 2: Fractures are generally 35-50° medium spaced planar to undulating rough partly open clean with rare brown staining and comminuted chalk infill (50/400/2525). Fracture set 3: Fractures are 65-85° medium spaced undulating rough partly open clean with occasional black specks/brown staining (115/400/1465). (Grade B2) | | | | |
| 20.10-20.20 | | | | | | 24 | D | | | | | | | |
| 20.20-21.70 (0:08) | | | | | | | | | | | 48[i] | | | |
| | | | | | | | | | | | 49[i] | | | |
| 20.55-20.70 | | | | | | 25 | D | | | | | | | |
| | | | | | NI 200 400 | | | | | . . . at 20.26m brown stained sponges. | | | | |
| | | | | | | | | | | . . . at 20.50m wispy marl. | 50[i] | | | |
| | 100% return Air+Mist (White) | | | | | | | | | | 51 | | | |
| | | | | | | | | | | | 52[i] | | | |
| | | | | | | | | | | . . . at 21.00m wispy marl. | 53[i] | | | |
| | | | | | | | | | | . . . at 21.20m brown stained sponges. | 54[i] | | | |
| 21.40-21.60 | | | | | | 26 | D | | | | 55[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 12 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (White) | | | | | | | | | Weak high density white with black specks CHALK. Fracture set 1: Fractures are 5-20° medium spaced planar to undulating rough clean with occasional black specks (80/300/1620). Fracture set 2: Fractures are generally 35-50° medium spaced planar to undulating rough partly open clean with rare brown staining and comminuted chalk infill (50/400/2525). Fracture set 3: Fractures are 65-85° medium spaced undulating rough partly open clean with occasional black specks/brown staining (115/400/1465). (Grade B2) *(stratum copied from 20.00m from* previous sheet) | 56[i] 57[i] | | | |
| 21.70-23.20 (0:07) | | | | | | | | | | | 58[i] 59[i] 60[i] | | | |
| 22.15-22.25 | | | | | | 27 | D | | | | 61[i] | | | |
| | 100% return Air+Mist (White) | 93 | 10 | 0 | NI 200 400 | | | | | . . . at 22.40m rare shells of possible micraster. | 62[i] 63[i] | | | |
| | | | | | | | | | | . . . at 22.70m and 22.76m small rinded flint (possible flint band). | 64[i] | | | |
| 22.90-23.05 | | | | | | 28 | D | | | | 65[i] | | | |
| | | | | | | | | | | . . . at 23.00m and 23.20m non intact recovered as angular fine to coarse gravel of chalk. | | | (6.20) | |
| 23.20-24.70 (0:08) | 100% return Air+Mist (White) | 100 | 67 | 57 | | | | | | | 66[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 13 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23.65-23.90 | 100% return Air+Mist (White) | 100 | 67 | 57 | NI 200 400 | 29 | D | | | Weak high density white with black specks CHALK. Fracture set 1: Fractures are 5-20° medium spaced planar to undulating rough clean with occasional black specks (80/300/1620). Fracture set 2: Fractures are generally 35-50° medium spaced planar to undulating rough partly open clean with rare brown staining and comminuted chalk infill (50/400/2525). Fracture set 3: Fractures are 65-85° medium spaced undulating rough partly open clean with occasional black specks/brown staining (115/400/1465). (Grade B2) *(stratum copied from 20.00m from* previous sheet) . . . at 24.156m very small rinded nodular flint up to 35mm. | 67[i] 69[i] 70[i] 71[i] 68[i] 72[i] | | | |
| 24.40-24.60 | | | | | | 30 | U | | | | | | | |
| 24.70-26.20 (0:06) | 100% return Air+Mist (White) | 73 | 32 | 30 | | | | | | | 73[i] 74[i] | | | |
| 25.35-25.45 | | | | | | 31 | D | | | . . . at 25.20m small rinded nodular flint and non intact between 25.00m and 25.50m. | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Inspection pit + Rotary Cored | Plant Used: | Beretta T.51 | Drilled By: | ??? | Logged By: | IFoster + BSaimen | Checked By: | AGS |
|---|---|---|---|---|---|---|---|---|---|

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 14 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25.75-25.85 | 100% return Air+Mist (White) | 73 | 32 | 30 | NI 200 400 | 32 | D | | | Weak high density white with black specks CHALK. Fracture set 1: Fractures are 5-20° medium spaced planar to undulating rough clean with occasional black specks (80/300/1620). Fracture set 2: Fractures are generally 35-50° medium spaced planar to undulating rough partly open clean with rare brown staining and comminuted chalk infill (50/400/2525). Fracture set 3: Fractures are 65-85° medium spaced undulating rough partly open clean with occasional black specks/brown staining (115/400/1465). (Grade B2) *(stratum copied from 20.00m from* previous sheet) | 75[i] | | | |
| 26.20-27.70 (0:10) | | | | | | | | | | . . . at 25.50m and 25.70m occasional clusters of brown sponges. | | 53.31 | 26.20 | |
| 26.28-26.38 | | | | | | 33 | D | | | . . . at 25.80m very small rinded flint and non intact between 25.03m and 25.10m. | 76[i] | | | |
| | 100% return Air+Mist (White) | 100 | 52 | 45 | NI 300 600 | | | | | Weak high density white light brown stained CHALK with occasional wispy marls and thick marls. Fracture set 1: Fractures are 0-25° medium to widely spaced undulating rough open clean with occasional comminuted and fragments of chalk and rare brown staining (70/400/980). Fracture Set 2: Fractures are 30-55° widely spaced udulating rough partly open to open clean (100/1800/3530). Fracture set 3: Fractures are 55-80° medium spaced planar to undulating rough partly open to open clean with black specks and slickensides (100/500/3480). (Grade C2) | 77[i] | | | |
| | | | | | | | | | | . . . at 26.30m group of wispy marl. | 78[i] | | | |
| | | | | | | | | | | . . . at 26.44m wispy marl. | | | | |
| | | | | | | | | | | . . . at 26.80m and 26.59m and 26.90m and 27.05m conjugated slickensided fractures/minor faults. | 79[i] | | | |
| 27.20-27.35 | | | | | | 34 | D | | | . . . between 27.00m and 27.20m rounded brown sponge. | | | | |
| | | | | | | | | | | | 80[i] | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 15 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (White) | 100 | 52 | 45 | | | | | | Weak high density white light brown stained CHALK with occasional wispy marls and thick marls. Fracture set 1: Fractures are 0-25° medium to widely spaced undulating rough open clean with occasional comminuted and fragments of chalk and rare brown staining (70/400/980). Fracture Set 2: Fractures are 30-55° widely spaced udulating rough partly open to open clean (100/1800/3530). Fracture set 3: Fractures are 55-80° medium spaced planar to undulating rough partly open to open clean with black specks and slickensides (100/500/3480). (Grade C2) *(stratum copied from 26.20m from* previous sheet) | 81[i] | | | |
| 27.70-29.20 (0:10) 27.75-28.25 | | | | | | 35 | U | | | | | | | |
| | 100% return Air+Mist (White) | 93 | 53 | 47 | NI 300 600 | | | | | . . . at 28.20m very small rinded nodular flint. | 82[i] | | | |
| | | | | | | | | | | . . . at 28.55m very small rinded nodular flint. | 83[i] | | | |
| | | | | | | | | | | . . . at 28.70m and 28.85m occasional brown sponges. | 84[i] | | | |
| 28.75-28.85 | | | | | | 36 | D | | | | 85[i] | | | |
| 29.20-30.70 (0:11) | 100% return Air+Mist (White) | 100 | 59 | 48 | | | | | | . . . at 29.30m and 29.37m group of wispy marl. | 86[i] | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 16 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29.65-29.90 | 100% return Air+Mist (White) | 100 | 59 | 48 | NI 300 600 | 37 | D | | | Weak high density white light brown stained CHALK with occasional wispy marls and thick marls. Fracture set 1: Fractures are 0-25° medium to widely spaced undulating rough open clean with occasional comminuted and fragments of chalk and rare brown staining (70/400/980). Fracture Set 2: Fractures are 30-55° widely spaced udulating rough partly open to open clean (100/1800/3530). Fracture set 3: Fractures are 55-80° medium spaced planar to undulating rough partly open to open clean with black specks and slickensides (100/500/3480). (Grade C2) *(stratum copied from 26.20m from* previous sheet) . . . at 29.65m very small nodular flint. . . . at 29.83m and 29.95m occasional clusters of orange brown sponges. . . . between 30.32m and 30.45m occasional brown stained clusters of sponges. | 87[i] 88[i] 89[i] 90[i] 91[i] 92[i] 93[i] | | | |
| 30.35-30.40 | | | | | | 38 | D | | | | | | | |
| 30.70-32.00 (0:10) | | | | | | | | | | | 94[i] | | | |
| 30.95-31.30 | | | | | | 39 | U | | | | | | | |
| | 100% return Air+Mist (White) | 96 | 62 | 62 | | | | | | . . . at 31.10m clusters of brown sponges and very small nodular flint up to 30mm. . . . at 31.25m wispy marl. . . . at 31.40m very small nodular flint up to 30mm. | 95[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Inspection pit + Rotary Cored | Plant Used: | Beretta T.51 | Drilled By: | ??? | Logged By: | IFoster + BSaimen | Checked By: | AGS |
|---|---|---|---|---|---|---|---|---|---|

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 17 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31.65-32.00 | 100% return Air+Mist (White) | 96 | 62 | 62 | | 40 | U | | | Weak high density white light brown stained CHALK with occasional wispy marls and thick marls. Fracture set 1: Fractures are 0-25° medium to widely spaced undulating rough open clean with occasional comminuted and fragments of chalk and rare brown staining (70/400/980). Fracture Set 2: Fractures are 30-55° widely spaced udulating rough partly open to open clean (100/1800/3530). Fracture set 3: Fractures are 55-80° medium spaced planar to undulating rough partly open to open clean with black specks and slickensides (100/500/3480). (Grade C2) *(stratum copied from 26.20m from* previous sheet) | 96[i] 97[i] | | | |
| 32.00-33.40 (0:10) | | | | | | | | | | | | | (11.80) | |
| 32.25-32.45 | | | | | | 41 | D | | | . . . at 31.50m occasional shells of possible incceramids. . . . at 31.70m shell fragment. . . . at 32.24m very small rinded nodular flint up to 50mm. . . . at 32.33m tabular flint up to 5mm thick and 60cm long. | 98 99 | | | |
| 32.80-33.00 | 100% return Air+Mist (White) | 100 | 69 | 62 | NI 300 600 | 42 | D | | | . . . at 32.48m occasional *Platyceramus* (with parallel ribs). | 100[i] | | | |
| 33.40-33.70 (0:10) | | 100 | 100 | 100 | | | | | | . . . at 32.97m very small nodular flint. . . . at 33.10m fragments of possible *Platyceramus*. . . . at 33.28m group of thick marl up to 10mm. | 101[i] 102[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 18 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33.65-33.75 | 100% return Air+Mist (White) | 100 | 100 | 100 | | 43 | D | | | Weak high density white light brown stained CHALK with occasional wispy marls and thick marls. Fracture set 1: Fractures are 0-25° medium to widely spaced undulating rough open clean with occasional comminuted and fragments of chalk and rare brown staining (70/400/980). Fracture Set 2: Fractures are 30-55° widely spaced udulating rough partly open to open clean (100/1800/3530). Fracture set 3: Fractures are 55-80° medium spaced planar to undulating rough partly open to open clean with black specks and slickensides (100/500/3480). (Grade C2) *(stratum copied from 26.20m from* previous sheet) | 103[i] | | | |
| 33.70-35.20 (0:10) | | | | | | | | | | | 104[i] | | | |
| | | | | | | | | | | | 105[i] | | | |
| 34.20-34.70 | | | | | | 44 | U | | | . . . at 33.80m group of wispy marl up to 10mm. | 106[i] | | | |
| | 100% return Air+Mist (White) | 100 | 47 | 33 | NI 300 600 | | | | | . . . at 34.65m group of wispy marl and thick marl up to 3mm. . . . at 34.70m a pebble up to 5mm phosphate. . . . between 34.75m and 34.87m large (120mm thick) rinded nodular flint. | 107[i] | | | |
| 35.00-35.10 | | | | | | 45 | D | | | | | | | |
| 35.20-36.70 (0:11) | 100% return Air+Mist (White) | 100 | 95 | 87 | | | | | | . . . at 35.20m group of wispy marl with rare brown sponges. | 108[i] | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 19 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35.65-36.20 | 100% return Air+Mist (White) | 100 | 95 | 87 | NI 300 600 | 46 | U | | | Weak high density white light brown stained CHALK with occasional wispy marls and thick marls. Fracture set 1: Fractures are 0-25° medium to widely spaced undulating rough open clean with occasional comminuted and fragments of chalk and rare brown staining (70/400/980). Fracture Set 2: Fractures are 30-55° widely spaced udulating rough partly open to open clean (100/1800/3530). Fracture set 3: Fractures are 55-80° medium spaced planar to undulating rough partly open to open clean with black specks and slickensides (100/500/3480). (Grade C2) *(stratum copied from 26.20m from* previous sheet) | 109[i] 110[i] | | | |
| 36.50-36.70 | | | | | | 47 | D | | | . . . at 35.50m very small up to 50mm nodular flint. . . . at 35.62m wispy marl. . . . at 35.70m rounded prospheric brown sponges. . . . at 35.80m very small nodular flint. . . . at 36.20m small (up to 70mm) rinded nodular flint. . . . at 36.30m possible *Platyceramus* with parallel ribs. | | | | |
| 36.70-38.20 (0:05) | 100% return Air+Mist (White) | 93 | 73 | 72 | | | | | | . . . between 36.60m and 36.70m group of wispy marl up to 2mm. | | | | |
| 37.35-37.75 | | | | | | 48 | U | | | . . . at 36.90m possible mirma chlamys cretosa (radiating ribs from umbo). . . . at 37.20m group of wispy marl up to 1mm. . . . at 37.22m very small nodular flint up to 25mm. . . . at 37.40m occasional brown sponges. | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Inspection pit + Rotary Cored | Plant Used: | Beretta T.51 | Drilled By: | ??? | Logged By: | IFoster + BSaimen | Checked By: | |
|---|---|---|---|---|---|---|---|---|---|

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **R618** |

| Contract Ref: | Start: **01.05.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **10.05.18** | **79.51** | **E:412770.9 N:141968.9** | **20** of **46** |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 37.90-38.00 | 100% return Air+Mist (White) | 93 | 73 | 72 | NI 300 600 | 49 | D | | | | | 41.51 | 38.00 | |
| 38.20-39.70 (0:05) | | | | | | | | | | Very weak to weak medium to high density white CHALK. Fracture set 1: fractures are 45-50° widely spaced undulating rough open with comminuted chalk (600/650/730). Single fracture at 40.04m 0° undulating rough open infilled with comminuted chalk. (Grade C2) | | | | |
| 38.45-38.60 | | | | | | 50 | D | | | . . . at 38.33m nodular rinded flints up to 15mm thick. | 111[i] | | | |
| | | | | | | | | | | . . . at 38.60m fragments of possible *Platyceramus* (with parallel ribs). . . . between 38.60m and 38.70m medium (up to 100mm) rinded flint. | 112[i] | | | |
| | 100% return Air+Mist (White) | 93 | 60 | 57 | 240 200 450 | | | | | . . . at 38.84m possible minor fault at 55° with slickensides. | | | (2.40) | |
| | | | | | | | | | | . . . at 39.34m small nodular rinded flint up to 50mm. | 113[i] | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Beretta T.51** | **???** | **IFoster + BSaimen** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 21 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 39.50-39.70 | 100% return Air+Mist (White) | 93 | 60 | 57 | 240 200 450 | 51 | D | | | Very weak to weak medium to high density white CHALK. Fracture set 1: fractures are 45-50° widely spaced undulating rough open with comminuted chalk (600/650/730). Single fracture at 40.04m 0° undulating rough open infilled with comminuted chalk. (Grade C2) *(stratum copied from 38.00m from* previous sheet) . . . at 39.82m very small nodular rinded flint up to 20mm. . . . at 39.85m rounded brown sponges. | | | | |
| 39.70-41.20 (0:05) | | | | | | | | | | | | | | |
| 40.00-40.20 | | | | | | 52 | D | | | | 114[i] | | | |
| | | | | | | | | | | | | 39.11 | 40.40 | |
| | 100% return Air+Mist (White) | 100 | 83 | 83 | 20 210 850 | | | | | Weak very high density white CHALK with thick marl beds and wispy marls. Fracture set 1: Fractures are 0-10° generally medium to widely spaced undulating rough open to moderately wide infilled with comminuted chalk frequently associated with marl layers with orange brown staining (20/450/1100). Fracture set 2: Fractures are 55-70° medium to widely spaced undulating rough moderately wide to wide infilled with comminuted chalk and occasional orange staining (470/680/2545). Single fracture at 42.05m 30° undulating rough open associated with marl layer. (LEWES NODULAR CHALK FORMATION Grade C2) . . . between 40.40m and 40.47m wispy marl. . . . between 40.50m and 40.60m thick marl seams up to 20mm with some nodular chalk. . . . at 40.95m fragments of possible *Platyceramus*. . . . at 41.25m thick (5mm) seam of marl. . . . between 41.25m and 41.35m occasional brown sponges. | 115[i] 116[i] | | | |
| 40.60-40.90 | | | | | | 53 | U | | | | | | | |
| 41.20-42.70 (0:05) | | | | | | | | | | | | | | |
| 41.30-41.45 | 100% return Air+Mist (White) | 100 | 93 | 85 | | 54 | D | | | | 117[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

**DRAFT**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **R618** |

| Contract Ref: | Start: **01.05.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **10.05.18** | **79.51** | **E:412770.9 N:141968.9** | **22** of **46** |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | . . . at 41.35m thick (10mm) seam of marl. | | | | |
| | | | | | | | | | | . . . at 41.48m very small rinded flint tup to 10mm. | | | | |
| | | | | | | | | | | Weak very high density white CHALK with thick marl beds and wispy marls. Fracture set 1: Fractures are 0-10° generally medium to widely spaced undulating rough open to moderately wide infilled with comminuted chalk frequently associated with marl layers with orange brown staining (20/450/1100). Fracture set 2: Fractures are 55-70° medium to widely spaced undulating rough moderately wide to wide infilled with comminuted chalk and occasional orange staining (470/680/2545). Single fracture at 42.05m 30° undulating rough open associated with marl layer. | 118[i] 119[i] 120[i] | | | |
| | 100% return Air+Mist (White) | 100 | 93 | 85 | | | | | | | | | | |
| 42.30-42.50 | | | | | 20 210 850 | 55 | U | | | (LEWES NODULAR CHALK FORMATION Grade C2) | 121[i] | | | |
| | | | | | | | | | | . . . between 40.40m and 40.47m wispy marl.*(stratum copied from* 40.40m from previous sheet) | 122[i] | | | |
| | | | | | | | | | | . . . at 41.75m very small rinded nodular flint. | | | | |
| | | | | | | | | | | . . . at 41.85m and 42.02m fracture filled tabular flint dipping at 65°. | | | | |
| | | | | | | | | | | . . . at 42.00m thick (20mm) marl seam. | | | | |
| 42.70-44.20 (0:06) | | | | | | | | | | . . . at 42.30m and 42.50m possible minor fault with slickensides on it. | | | | |
| | | | | | | | | | | . . . at 42.67m small nodular tabular flint. | | | | |
| | | | | | | | | | | . . . at 42.80m very small nodular flint. | | | | |
| | 100% return Air+Mist (White) | | | | | | | | | | | | | |
| 43.10-43.20 | | 97 | 93 | 90 | | 56 | D | | | . . . at 43.05m thick (40cm) marl seam. | 123[i] | | (5.45) | |
| 43.25-43.60 | | | | | | 57 | U | | | . . . at 43.20m shells of possible *Platyceramus* (with parallel ribs). | 124[i] | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Beretta T.51** | **???** | **IFoster + BSaimen** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 23 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (White) | 97 | 93 | 90 | | | | | | Weak very high density white CHALK with thick marl beds and wispy marls. Fracture set 1: Fractures are 0-10° generally medium to widely spaced undulating rough open to moderately wide infilled with comminuted chalk frequently associated with marl layers with orange brown staining (20/450/1100). Fracture set 2: Fractures are 55-70° medium to widely spaced undulating rough moderately wide to wide infilled with comminuted chalk and occasional orange staining (470/680/2545). Single fracture at 42.05m 30° undulating rough open associated with marl layer. (LEWES NODULAR CHALK FORMATION Grade C2) | 125[i] | | | |
| 44.20-45.70 (0:14) | | | | | | | | | | . . . between 40.40m and 40.47m wispy marl.*(stratum copied from* 40.40m from previous sheet) | | | | |
| 44.40-44.90 | | | | | 20 210 850 | 58 | U | | | . . . at 43.65m very small nodular ringed flint up to 30mm. . . . at 43.70m fragments of possible volviceramus. . . . at 43.90m and 44.05m group of thick marl seams (6mm) with wispy marl. . . . at 43.93m and 44.08m occasional thick marl seam up to 5mm with wispy marls. . . . at 44.10m very small nodular flint. | | | | |
| | 100% return Air+Mist (White) | 100 | 93 | 90 | | | | | | . . . at 44.90m very small rinded flint. | 126[i] | | | |
| | | | | | | | | | | . . . at 45.06m sheet flint up to 3mm. . . . at 45.10m fragments of possible *Platyceramus* (with parallel ribs). | 127[i] | | | |
| 45.25-45.45 | | | | | | 59 | D | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 24 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (White) | 100 | 93 | 90 | 20 210 850 | | | | | . . . between 45.58m and 45.68m sheet flint along a fracture. | 128[i] | | | |
| 45.70-47.20 (0:12) | | | | | | | | | | | | 33.66 | 45.85 | |
| | | | | | | | | | | Weak high density white CHALK with occasional wispy thick marl seams. Fractures are generally 5-15° closely spaced undulating rough party open clean with rare comminuted chalk infill. (LEWES NODULAR CHALK FORMATION Grade B2) . . . at 46.00m very small nodular flint. | | | | |
| 46.35-46.45 | 100% return Air+Mist (White) | 100 | 97 | 62 | 100 200 1170 | 60 | D | | | . . . at 46.24m thick marl seam up to 15mm. | 129[i] | | | |
| | | | | | | | | | | . . . at 46.40m and 47.20m wispy marl up to 2mm. | 130[i] | | | |
| | | | | | | | | | | . . . at 46.50m possible *Platyceramus* (with parallel ribs). | 131[i] | | | |
| | | | | | | | | | | . . . at 46.54m thick marl seam up to 10mm. | 132[i] | | | |
| | | | | | | | | | | | 133[i] | | | |
| 46.85-47.05 | | | | | | 61 | D | | | | 134[i] | | | |
| | | | | | | | | | | | 135[i] | | | |
| 47.20-48.70 (0:07) | 100% return Air+Mist (White) | 100 | 100 | 94 | | | | | | | 136[i] | | (2.85) | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R618 |

| Contract Ref: | Start: 01.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 10.05.18 | 79.51 | E:412770.9 N:141968.9 | 25 of 46 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47.60-48.00 | | | | | | 62 | U | | | Weak high density white CHALK with occasional wispy thick marl seams. Fractures are generally 5-15° closely spaced undulating rough party open clean with rare comminuted chalk infill. (LEWES NODULAR CHALK FORMATION Grade B2) *(stratum copied from 45.85m from* previous sheet) | | | | |
| 48.00-48.20 | 100% return Air+Mist (White) | 100 | 100 | 94 | 100<br>200<br>1170 | 63 | D | | | . . . at 48.08m very small rinded nodular flint. . . . between 48.12m and 48.34m group of thick marl up to 5mm and wispy marl. | 137[i] | | | |
| | | | | | | | | | | . . . at 48.60m possible *Platyceramus* . | | 30.81 | 48.70 | |
| | | | | | | | | | | Inspection pit terminated at 48.70m depth. | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Beretta T.51 | ??? | IFoster + BSaimen | |

**Appendix 4: R619 Borehole Log**

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 1 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |
| | | | | | | | | | | Brown slightly gravelly sandy SILT with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of chalk and flint. Cobbles are angular to subrounded flint. | | 79.33 | (0.30) 0.30 | |
| 0.50 | | | | | | 101 | ES | | | Cream and pale brown structureless CHALK comprising sandy gravelly SILT. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of chalk and rare flint. (Grade Dm) | | 78.83 | (0.50) 0.80 | |
| 0.80 | | | | | | 102 | ES | | | White and cream structureless CHALK comprising slightly sandy silty subangular to subrounded fine to coarse GRAVEL of chalk and rare flint with low cobble content. Sand is fine to coarse. Cobbles are angular to subrounded chalk and flint. (Grade Dc) | | 78.13 | (0.70) 1.50 | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 20/04/18 | 14:00 | 6.00 | 1.50 | 146 | 5.20 |
| 23/04/18 | 08:00 | 6.00 | 1.50 | 146 | 5.20 |
| 23/04/18 | 17:30 | 18.50 | 1.50 | 146 | 5.20 |
| 24/04/18 | 08:00 | 18.50 | 1.50 | 146 | 5.20 |
| 24/04/18 | 17:00 | 21.40 | 12.00 | 146 | 5.20 |
| 25/04/18 | 08:00 | 21.40 | 12.00 | 146 | 5.40 |
| 25/04/18 | 17:30 | 39.10 | 12.00 | 146 | 5.50 |
| 26/04/18 | 08:00 | 39.10 | 12.00 | 146 | 5.40 |

## General Remarks

1. Location CAT scanned prior to excavation.
2. First strata encountered excavated by Archaeologists.
3. Hand dug inspection pit to 1.50m depth on 27/03/2018.
4. No groundwater strikes noted by the driller.
5. Borehole drilled using a 146mm geobore S core barrel and air mist as the flush medium.
6. 50mm PVC groundwater monitoring pipe installed as shown.

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 2 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.50-3.00 (0:08) | 90% return Air+Mist (White) | 60 | 0 | 0 | NI 40 70 | | | | | Very weak medium density white slightly brown stained CHALK. Bedding fractures are 5-10° very closely to closely spaced undulating rough open infilled with white comminuted chalk up to 2mm and brown staining (50/150/230). Single fractures at 2.80m and 2.85m are 20° and 80° undulating rough partly open and open with light brown staining. (Grade C4) . . . at 1.50m small fragment of (<50mm) thinly rinded flint. | | | (1.40) | |
| 2.50-3.00 | | | | | | 5 | D | | | . . . at 2.47m and 2.53m chalk is locally extremely weak. | 1[i] 2[i] | | | |
| | | | | | | | | | | . . . at 2.75m very small rinded nodular flint (30mm). | 3[i] 5[i] 4[i] | | | |
| 3.00-4.50 (0:09) | 90% return Air+Mist (White) | 60 | 8 | 0 | NI 50 95 | | | | | Weak high density white CHALK. Fracture set 1: Bedding fractures are 10° closely spaced undulating rough open infilled with comminuted chalk and rare light brown staining (20/70/90). Fracture set 2: Fractures are 45° and 50° medium spaced undulating rough open infilled with occasional comminuted chalk and light brown staining (375). Single fracture at 3.80m 85° undulating rough open brown staining and black specks. (Grade C4) | | 76.73 | 2.90 | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 26/04/18 | 16:30 | 42.10 | 12.00 | 146 | - |
| 27/04/18 | 08:00 | 42.10 | 12.00 | 146 | 6.90 |
| 27/04/18 | 16:30 | 48.10 | 12.00 | 146 | - |
| 30/04/18 | 08:30 | 48.10 | 12.00 | 146 | 5.80 |
| 30/04/18 | 16:45 | 48.10 | 12.00 | 146 | 6.08 |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **R619** |

| Contract Ref: | Start: **20.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **30.04.18** | **79.63** | **E:412785.8 N:141969.2** | **3** of **49** |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 90% return Air+Mist (White) | 60 | 8 | 0 | NI 50 95 | | | | | Weak high density white CHALK. Fracture set 1: Bedding fractures are 10° closely spaced undulating rough open infilled with comminuted chalk and rare light brown staining (20/70/90). Fracture set 2: Fractures are 45° and 50° medium spaced undulating rough open infilled with occasional comminuted chalk and light brown staining (375). Single fracture at 3.80m 85° undulating rough open brown staining and black specks. (Grade C4) *(stratum copied from 2.90m from* previous sheet) . . . between 4.00m and 4.08m large nodular rinded flint up to 60mm. | 6[i] 7[i] 8[i] 9[i] 10[i] 11[i] 12[i] | | | |
| 4.35-4.50 | | | | | | 6 | D | | | . . . at 4.23m inflated *Micraster* fossil. . . . at 4.30m fragment of inoceramid (fibrous calcite). | | | (3.10) | |
| 4.50-6.00 (0:09) | 90% return Air+Mist (White) | 27 | 0 | 0 | NI | | | | | . . . between 4.50m and 6.00m recovered as angular fine to coarse gravel and cobble sized fragments. | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450** | **Stuart Crawford** | **IFoster + BSaimen** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 4 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.50-6.00 | 90% return Air+Mist (White) | 27 | 0 | 0 | NI | 7 | D | | | Weak high density white CHALK. Fracture set 1: Bedding fractures are 10° closely spaced undulating rough open infilled with comminuted chalk and rare light brown staining (20/70/90). Fracture set 2: Fractures are 45° and 50° medium spaced undulating rough open infilled with occasional comminuted chalk and light brown staining (375). Single fracture at 3.80m 85° undulating rough open brown staining and black specks. (Grade C4) | | 73.63 | 6.00 | |
| 6.00-7.50 (0:10) | 90% return Air+Mist (White) | 0 | 0 | 0 | | | | | | *(stratum copied from 2.90m from* previous sheet) . . . at 5.50m large spongy rinded flint 120 x 60mm. Assumed zone of core loss. | | | | AZCL |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 5 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.50-8.50 (0:05) 7.50-7.85 | | | | | | 1 | SPT | | | Assumed zone of core loss. *(stratum copied from 6.00m from* previous sheet) | | | | |
| | 90% return Air+Mist (White) | 0 | 0 | 0 | | | | | | | | | (4.50) | |
| 8.50-9.50 (0:05) | | | | | | | | | | | | | | AZCL |
| | 90% return Air+Mist (White) | 0 | 0 | 0 | | | | | | | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **R619** |

| Contract Ref: | Start: **20.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **30.04.18** | **79.63** | **E:412785.8 N:141969.2** | **6** of **49** |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9.50-10.50 (0:10) 9.50-9.95 | 90% return Air+Mist (White) | 0 | 0 | 0 | | 2 | SPT | | | Assumed zone of core loss. *(stratum copied from 6.00m from* previous sheet) | | | | AZCL |
| | | | | | | | | | | | | 69.13 | 10.50 | |
| 10.50-11.00 (0:08) | 80% return Air+Mist (White) | 80 | 0 | 0 | NI | | | | | Very weak white CHALK. Recovered as angular gravel of chalk. Fractures surface are slightly brown with black specks. . . . at 10.50m small fragments of flint up to 30mm. | | | (0.50) | |
| 10.80-11.00 | | | | | | 8 | D | | | | | | | |
| | | | | | | | | | | | | 68.63 | 11.00 | |
| 11.00-11.70 (0:05) | 80% return Air+Mist (White) | 100 | 0 | 0 | NI NI 60 | | | | | Very weak to weak medium density white locally brown stained CHALK. Single fractures at 11.19m and 11.30m are 50° and 80° planar rough and undulating rough open with brown staining and rear black specks. (Grade B4) . . . between 11.00m and 11.10m small fragments of nodular flint (possible flint band) up to 50mm thick. . . . at 11.40m and 11.50m non intact recovered as angular fine o coarse | 13[i] 14[i] | | | |
| | 90% return Air+Mist (White) | | | | | | | | | | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450** | **Stuart Crawford** | **IFoster + BSaimen** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 7 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11.50-11.70 | 90% return Air+Mist (White) | 100 | 0 | 0 | | 9 | D | | | gravel size fragments. Very weak to weak medium density white locally brown stained CHALK. Single fractures at 11.19m and 11.30m are 50° and 80° planar rough and undulating rough open with brown staining and rear black specks. (Grade B4) . . . between 11.00m and 11.10m small fragments of nodular flint (possible flint band) up to 50mm thick.*(stratum copied from 11.00m* from previous sheet) . . . at 11.55m brown stained sponges. . . . at 11.57m wispy thin marl up to 1mm. . . . at 11.80m thin wispy marl up to 1mm. | | | (1.20) | |
| 11.70-12.20 (0:10) | 90% return Air+Mist (White) | 80 | 0 | 0 | NI NI 60 | | | | | | | 67.43 | 12.20 | |
| 12.00-12.20 | | | | | | 10 | D | | | | | | | |
| 12.20-13.50 (0:15) | | | | | | | | | | . . . at 11.82m possible brown sponge. . . . at 11.90m wispy marl up to 1mm. . . . between 11.90m and 12.20m non intact recovered as angular fine to coarse gravel size chalk. . . . at 12.00m very small rinded flint 90 x 25mm. Very weak to weak white medium to high density CHALK with occasional rinded flints. Fracture set 1: Fractures are 45-55° widely spaced planar to undulating rough and striated open with occasional black specks and rare brown staining. Fracture Set 2: Fractures are 80-85° planar rough partly open with black specks. Single fracture at 13.02m 25° undulating rough open infilled with fine gravel of chalk. (Grade B3) . . . at 12.68m very small fragments of rinded flint up to 20mm. . . . at 12.78m very small fragments of rinded flint up to 15mm. at 12.78m rinded brown sponges. . . . at 13.16m very small rinded flint 30mm thick x 80mm length. . . . between 13.20m and 13.25m possible minor movement along a polished and slickensided discontinuity (55°). . . . between 13.30m and 15.00m non intact recovered as angular fine | 15[i] 16[i] 17[i] 19[i] 18[i] 20[i] 21[i] | | | |
| 12.80-13.00 | 90% return Air+Mist (White) | 85 | 0 | 0 | NI 100 140 | 11 | D | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 8 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13.50-15.00 (0:15) | 80% return Air+Mist (White) | 33 | 0 | 0 | NI 100 140 | | | | | to coarse gravel size chalk and flint. Very weak to weak white medium to high density CHALK with occasional rinded flints. Fracture set 1: Fractures are 45-55° widely spaced planar to undulating rough and striated open with occasional black specks and rare brown staining. Fracture Set 2: Fractures are 80-85° planar rough partly open with black specks. Single fracture at 13.02m 25° undulating rough open infilled with fine gravel of chalk. (Grade B3) *(stratum copied from 12.20m from* previous sheet) . . . between 13.50m and 13.65m small fragments of rinded nodular flint (possible band of flint). | | | (2.80) | |
| 14.80-15.00 | | | | | | 12 | D | | | | | 64.63 | 15.00 | |
| 15.00-16.00 (0:10) | | | | | | | | | | Very weak medium density locally weak white locally brown stained CHALK. Fracture set 1: Fractures are 35-55° medium spaced undulating rough open with brown staining (230/300/430). Fracture set 2: Fractures are 70-75° planar rough partly open with black specks (150/200/465). Single fracture at 15.32m 20° planar rough partly open with black specks. (Grade B3) . . . between 15.10m and 15.27m occasional brown stained sponges. | 22[i] 23[i] 25[i] 24[i] 26[i] | | | |
| 15.20-15.40 | 80% return Air+Mist (White) | 100 | 25 | 11 | NI 100 180 | 13 | D | | | | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 9 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80% return Air+Mist (White) | 100 | 25 | 11 | NI | | | | | Very weak medium density locally weak white locally brown stained CHALK. Fracture set 1: Fractures are 35-55° medium spaced undulating rough open with brown staining (230/300/430). Fracture set 2: Fractures are 70-75° planar rough partly open with black specks (150/200/465). Single fracture at 15.32m 20° planar rough partly open with black specks. (Grade B3) *(stratum copied from 15.00m from* previous sheet) . . . between 15.50m and 15.90m occasional brown stained sponges. | 27[i] 28[i] 29[i] | | (1.50) | |
| 16.00-16.50 (0:08) | | | | | 100 | | | | | | | | | |
| 16.10-16.40 | 80% return Air+Mist (White) | 100 | 100 | 20 | 180 | 14 | D | | | | | 63.13 | 16.50 | |
| 16.50-17.00 (0:08) | 80% return Air+Mist (White) | 0 | 0 | 0 | | | | | | Assumed zone of core loss. | | 62.63 | (0.50) 17.00 | AZCL |
| 17.00-17.50 (0:10) | | | | | | | | | | Weak high density white CHALK containing flint. Recovered as angular gravel and cobbles of chalk and flint. . . . at 17.15m very small fragments of rinded flint. | | | | |
| 17.25-17.40 | 80% return Air+Mist (White) | 100 | 0 | 0 | NI | 15 | D | | | | | 62.13 | (0.50) 17.50 | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 10 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.50-18.50 (0:12) | | | | | | | | | | Weak high density white CHALK with rare flint nodules and bands. Fracture set 1: Fractures are 5-25° closely spaced planar to undulating rough partly open to open with black specks (80/200/1110). Fracture set 2: Fractures are 35-50° medium spaced planar rough partly open with black specks and brown staining (60/350/955). Fracture set 3: Fractures are 60-80° medium to widely spaced planar to undulating rough partly open to open with black specks and rare brown staining (170/300/740). (Grade B4) | | | | |
| 17.60-17.80 | | | | | | 16 | D | | | | 30[i] 31[i] | | | |
| | 80% return Air+Mist (White) | 100 | 23 | 16 | | | | | | | 32[i] 33[i] | | | |
| | | | | | | | | | | . . . at 17.90m occasional brown stained sponges. . . . at 18.00m very small fragments of rinded nodular flint. | 34[i] 35[i] 36[i] | | | |
| 18.30-18.45 | | | | | | 17 | D | | | | | | | |
| 18.50-19.50 (0:12) | | | | | NI 100 230 | | | | | . . . between 18.50m and 18.87m non intact recovered as angular fine to coarse gravel size fragments of chalk and flint. | | | (2.75) | |
| | | | | | | | | | | . . . at 18.75m small fragments of rinded nodular flint. | | | | |
| | 80% return Air+Mist (White) | 80 | 8 | 0 | | | | | | . . . between 18.90m and 19.07m possible slickensided discontinuity dipping at 60°. . . . at 18.98m occasional brown stained sponges. | 38[i] 37[i] 39[i] 40[i] 41[i] 42[i] | | | |
| 19.00-19.10 | | | | | | 18 | D | | | | | | | |
| | | | | | | | | | | . . . between 19.37m and 19.50m recovered non intact as gravel size fragments. | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 11 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19.50-20.25 (0:15)<br>19.50-19.70 | 80% return Air+Mist (White) | 100 | 43 | 15 | NI<br>100<br>230 | 19 | D | | | Weak high density white CHALK with rare flint nodules and bands. Fracture set 1: Fractures are 5-25° closely spaced planar to undulating rough partly open to open with black specks (80/200/1110). Fracture set 2: Fractures are 35-50° medium spaced planar rough partly open with black specks and brown staining (60/350/955). Fracture set 3: Fractures are 60-80° medium to widely spaced planar to undulating rough partly open to open with black specks and rare brown staining (170/300/740).<br>(Grade B4)<br>*(stratum copied from 17.50m from* previous sheet)<br>. . . at 19.90m occasional brown stained sponges. | 43[i]<br>44[i]<br>46[i]<br>45[i] | | | |
| 20.10-20.25 | | | | | | 20 | D | | | | | 59.38 | 20.25 | |
| 20.25-20.70 (0:10) | 80% return Air+Mist (White) | 67 | 11 | 0 | NI | | | | | No chalk recovered. Recovery consists of very strong black FLINT containing brown mottling recovered as angular gravel and cobbles. Possible flint band. | | | (0.55) | |
| 20.70-20.80 (0:10) | 80% return Air+Mist (White) | 80 | 0 | 0 | | | | | | | | 58.83 | 20.80 | |
| 20.80-21.40 (0:12) | 80% return Air+Mist (White) | 33 | 0 | 0 | NI | | | | | Weak high density white CHALK. Recovered as angular gravel and cobbles of chalk.<br>. . . at 21.00m very small fragments of rinded spikey flint. | | | (0.60) | |
| 21.20-21.40 | | | | | | 21 | D | | | | | 58.23 | 21.40 | |
| 21.40-22.15 (0:08) | 80% return Air+Mist | 93 | 56 | 43 | NI | | | | | *Description on next sheet* | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 12 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (White) | | | | NI | | | | | Weak high density white light brown stained CHALK with occasional brown stained sponge bands. Recovered as irregular cobbles of chalk. (Grade B3) *(stratum copied from 21.40m from* previous sheet) | | | (0.40) | |
| | 80% return Air+Mist (White) | 93 | 56 | 43 | | | | | | . . . at 21.70m fine to coarse fragments of prismatic *Micraster* shells. | | 57.83 | 21.80 | |
| 21.90-22.15 | | | | | | 22 | U | | | . . . between 21.75m and 21.88m occasional brown stained sponges. | | | | |
| 22.15-23.05 (0:08) | | | | | | | | | | Weak high density white light brown stained CHALK with occasional brown stained sponge bands. Bedding fractures are generally 5° medium undulating rough open infilled with comminuted chalk up to 2mm (40/250/550). Single fracture at 23.55m 20° undulating rough open with brown staining. (Grade B3) | | | | |
| | 80% return Air+Mist (White) | 100 | 100 | 100 | NI 300 610 | | | | | . . . between 22.25m and 22.43m bed of brown stained sponges. | | | | |
| 22.75-23.05 | | | | | | 23 | U | | | . . . between 22.80m and 22.90m occasional brown stained sponges. | | | | |
| 23.05-23.90 (0:10) | | | | | | | | | | | | | (2.50) | |
| 23.15-23.35 | 80% return Air+Mist (White) | 96 | 60 | 53 | | 24 | D | | | | 47[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 13 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80% return Air+Mist (White) | 96 | 60 | 53 | NI 300 610 | | | | | Weak high density white light brown stained CHALK with occasional brown stained sponge bands. Bedding fractures are generally 5° medium undulating rough open infilled with comminuted chalk up to 2mm (40/250/550). Single fracture at 23.55m 20° undulating rough open with brown staining. (Grade B3) *(stratum copied from 21.80m from* previous sheet) | 48[i] 49[i] 50[i] | | | |
| 23.90-25.40 (0:19) 23.90-24.20 | | | | | | 25 | U | | | . . . at 23.63m nodular flint up to 30mm. . . . at 23.66m sheet flint up to 20mm. . . . at 23.73m occasional brown sponges. | | | | |
| | 70% return Air+Mist (White) | | | | | | | | | | 51[i] | | | |
| | | | | | | | | | | . . . at 24.27m brown stained sponges. | | 55.33 | 24.30 | |
| | | 100 | 43 | 33 | NI 180 | | | | | Weak high density white light brown stained CHALK with occasional brown stained sponge bands. Fracture set 1: Bedding fracture at 25.25m 10° undulating rough open infilled with comminuted chalk up to 2mm. Fracture set 2: Fractures are 55 and 75° closely spaced undulating rough partly open to open with brown staining and black specks (195/195/665). (Grade B3) | 52[i] 53[i] | | (1.10) | |
| 25.00-25.20 | 70% return Air+Mist (White) | | | | | 26 | D | | | . . . at 24.42m fragments of *Micraster* shells. . . . at 24.45m zoophycos flint. . . . between 24.47m and 24.51m very small fragments of nodular rinded flint. . . . at 24.60m and 24.65m occasional brown stained sponges. . . . at 24.85m and 24.95m non intact recovered as angular fine to coarse gravel size chalk. | | | | |
| | | | | | | | | | | | 54[i] | | | |
| 25.40-26.90 (0:09) | 70% return Air+Mist | 80 | 50 | 50 | NI 180 | | | | | *Description on next sheet* | | 54.23 | 25.40 | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 14 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (White) | | | | 250 | | | | | Weak high density white CHALK with occasional wispy marl and rare inoceramid (possible platyceramus). Recovered non intact and fractures have not assessed due to possible drilling induced action through the flints. (Grade B3) *(stratum copied from 25.40m from* previous sheet) . . . at 25.50m occasional inceramids (possible *Platyceramus*) shells and groups of wispy marls. . . . at 25.63m group of wispy fine marl. | | | | |
| 25.80-26.20 | | | | | | 27 | D | | | | | | | |
| | 70% return Air+Mist (White) | 80 | 50 | 50 | NI 180 250 | | | | | | | | (1.50) | |
| 26.70-26.90 | | | | | | 28 | D | | | . . . at 26.55m and 26.61m small fine to coarse fragments of flint up to 55mm. . . . at 26.74m wispy marl. | | | | |
| | | | | | | | | | | | | 52.73 | 26.90 | |
| 26.90-27.10 (0:04) | 80% return Air+Mist (White) | 0 | 0 | 0 | | | | | | Assumed zone of core loss. . . . between 26.90m and 27.10m no recovery. Driller notes clearing flints on log. | | | (0.20) | AZCL |
| | | | | | | | | | | | | 52.53 | 27.10 | |
| 27.10-27.60 (0:06) | | | | | | | | | | Very weak to weak medium to high density white slightly brown stained CHALK. Recovered non intact between 28.10m and 28.60m depth and fractures have not assessed due to possible drilling induced action. | | | | |
| 27.30-27.50 | 80% return Air+Mist (White) | 40 | 0 | 0 | NI | 29 | D | | | . . . at 27.40m occasional rounded brown stained sponges and | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 15 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 40 | 0 | 0 | NI | | | | | glauconite coated rounded sponges. Very weak to weak medium to high density white slightly brown stained CHALK. Recovered non intact between 28.10m and 28.60m depth and fractures have not assessed due to possible drilling induced action. *(stratum copied from 27.10m from* previous sheet) | | | | |
| 27.60-28.10 (0:05) | 80% return Air+Mist (White) | 0 | 0 | 0 | | | | | | | | | | |
| 28.10-28.60 (0:05) | | | | | | | | | | | | | (2.00) | |
| 28.30-28.50 | 80% return Air+Mist (White) | 100 | 24 | 0 | | 30 | D | | | . . . at 28.36m wispy and streaky marl. . . . at 28.42m possible brown phosphatic pebble up to 5mm. . . . at 28.45m shell fragments of inoceramid (possible *Platyceramus*). . . . between 28.50m and 28.60m frequent brown stained sponges. | | | | |
| 28.60-29.10 (0:07) 28.60-28.75 | 70% return Air+Mist (White) | 84 | 76 | 76 | NI 80 200 | 31 | U | | | . . . at 28.95m possible *Micraster*. . . . at 29.00m very small fragments of flint nodular up to 20mm. | | 50.53 | 29.10 | |
| 29.10-30.10 (0:09) | | | | | | | | | | *Description on next sheet* | 55 | | | |
| 29.30-29.65 | 70% return Air+Mist (White) | 100 | 73 | 70 | 30 200 650 | 32 | U | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 16 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29.80-30.10 | 70% return Air+Mist (White) | 100 | 73 | 70 | | 33 | D | | | Weak locally very weak high density white CHALK with occasional wispy marls. Fracture set 1: Bedding fractures are generally 5° closely and widely spaced undulating rough open with black specks (105/700/965). Fracture set 2: Fractures are 20-35° closely spaced undulating rough open with light brown staining (140/140/2000). Fracture set 3: Fractures are 50-60° medium spaced undulating rough partly open to open with black specks with light brown staining (530/720/1700). (Grade B3) *(stratum copied from 29.10m from* previous sheet) | 56[i] | | | |
| | | | | | | | | | | | 57[i] | | | |
| | | | | | | | | | | | 58[i] | | | |
| 30.10-31.60 (0:06) | | | | | | | | | | . . . at 29.82m group of thin wispy marl. . . . at 29.93m locally chalk increases in strength - possible hard ground. . . . at 30.06m streaky marl. . . . at 30.17m very small rinded flint up to 30mm. | | | | |
| | | | | | | | | | | | 59[i] | | | |
| 30.40-30.70 | | | | | 30 200 650 | 34 | U | | | . . . at 30.20m group of thin wispy marl. . . . at 30.48m streaky marl. | | | (3.00) | |
| | 70% return Air+Mist (White) | 100 | 75 | 62 | | | | | | . . . at 30.85m wispy marl. | | | | |
| | | | | | | | | | | . . . at 30.95m wispy marl. | 60[i] | | | |
| | | | | | | | | | | . . . at 31.00m very small nodular rinded flints. . . . at 31.10m finger shaped flint. | | | | |
| | | | | | | | | | | . . . at 31.30m streaky marl. | | | | |
| | | | | | | | | | | | 61[i] | | | |
| 31.40-31.60 | | | | | | 35 | D | | | | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 17 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | 75 | 62 | | | | | | Weak locally very weak high density white CHALK with occasional wispy marls. Fracture set 1: Bedding fractures are generally 5° closely and widely spaced undulating rough open with black specks (105/700/965). Fracture set 2: Fractures are 20-35° closely spaced undulating rough open with light brown staining (140/140/2000). Fracture set 3: Fractures are 50-60° medium spaced undulating rough partly open to open with black specks with light brown staining (530/720/1700). (Grade B3) *(stratum copied from 29.10m from* previous sheet) | 62[i] | | | |
| 31.60-32.10 (0:05) 31.60-31.95 | | | | | | 36 | U | | | | | | | |
| | 80% return Air+Mist (White) | 80 | 80 | 80 | 30 200 650 | | | | | | | | | |
| | | | | | | | | | | | | 47.53 | 32.10 | |
| 32.10-33.10 (0:08) | | | | | | | | | | . . . at 31.50m streaky and wispy marl and occasional fragments of incornmoids (possibly platycerams). No chalk recovered. Recovery consists of very strong black FLINT containing brown mottling recovered as angular gravel and cobbles. Possible flint band. | | | (1.00) | |
| | 80% return Air+Mist (White) | 10 | 0 | 0 | NI | | | | | | | | | |
| | | | | | | | | | | | | 46.53 | 33.10 | |
| 33.10-33.95 (0:07) | | | | | | | | | | *Description on next sheet* | | | | |
| | 80% return Air+Mist (White) | 94 | 91 | 84 | 80 300 450 | | | | | . . . between 33.40m and 33.50m occasional streaky marl. | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **R619** |

| Contract Ref: | Start: **20.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **30.04.18** | **79.63** | **E:412785.8 N:141969.2** | **18** of **49** |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33.65-33.95 | 80% return Air+Mist (White) | 94 | 91 | 84 | 80 300 450 | 37 | D | | | Weak high density white with light black specks CHALK with occasional wispy and thin to thick marl. Fracture set 1: Bedding fractures are 5° medium spaced undulating rough partly open to open with light brown staining and black specks (180/400/1465). Single fractures at 36.30m and 37.08m 25° and 65° undulating rough open and clean with light brown staining and black specks. (Grade B2) | 63[i] | | | |
| 33.95-34.60 (0:08) | | | | | | | | | | . . . at 33.10m occasional shells of inoceramid (possible *Platyceramus* up to 1mm thick).*(stratum copied* from 33.10m from previous sheet) | 64[i] | | | |
| 34.15-34.40 | 70% return Air+Mist (White) | 92 | 83 | 83 | | 38 | U | | | . . . at 33.55m marl up to 5mm. . . . at 33.62m marl up to 8mm. . . . at 33.75m very small rinded flint nodule up to 30mm. . . . at 34.08m occasional inoceramid (possible *Platyceramus*) up to 2mm. . . . at 34.25m fragments of possible *Platyceramus* up to 2mm thick. . . . between 34.38m and 34.43m group of wispy marls. | 65[i] | | | |
| 34.60-35.35 (0:07) | | | | | | | | | | . . . at 34.48m occasional brown stained sponge. | 66[i] | | | |
| 34.90-35.30 | 80% return Air+Mist (White) | 80 | 63 | 63 | | 39 | U | | | | 67[i] | | | |
| 35.35-36.10 (0:06) | 70% return Air+Mist (White) | 100 | 80 | 76 | | | | | | . . . at 35.30m thick marl up to 4mm. . . . between 35.35m and 35.58m group of wispy marl. | | | (4.50) | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450** | **Stuart Crawford** | **IFoster + BSaimen** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 19 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35.50-35.80 | 70% return Air+Mist (White) | 100 | 80 | 76 | | 40 | U | | | Weak high density white with light black specks CHALK with occasional wispy and thin to thick marl. Fracture set 1: Bedding fractures are 5° medium spaced undulating rough partly open to open with light brown staining and black specks (180/400/1465). Single fractures at 36.30m and 37.08m 25° and 65° undulating rough open and clean with light brown staining and black specks. (Grade B2) | 68[i] | | | |
| 36.10-37.60 (0:08) | | | | | | | | | | . . . at 33.10m occasional shells of inoceramid (possible *Platyceramus* up to 1mm thick).*(stratum copied* from 33.10m from previous sheet) . . . at 35.50m full diameter inoceramid (possible *Platyceramus*). . . . at 35.67m fragments of inoceramid up to 4mm. . . . at 35.90m very small fragments of flint. | 69[i] | | | |
| 36.50-36.85 | | | | | 80 300 450 | 43 | U | | | . . . at 36.33m group of wispy marl. . . . at 36.50m wispy marl. | | | | |
| | 70% return Air+Mist (White) | 100 | 81 | 81 | | | | | | . . . at 36.82m wispy marl. | | | | |
| | | | | | | | | | | . . . at 36.97m rounded phosopheric sponge. | 70 | | | |
| 37.30-37.60 | | | | | | 44 | D | | | . . . at 37.20m occasional brown stained sponge. | 71[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **R619** |

| Contract Ref: | Start: **20.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **30.04.18** | **79.63** | **E:412785.8 N:141969.2** | **20** of **49** |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | 81 | 81 | | | | | | . . . at 37.50m occasional fragments of possible *Platyceramus* up to 1mm thick. | | 42.03 | 37.60 | |
| 37.60-39.10 (0:07) 37.60-37.90 | | | | | | 41 | D | | | Weak locally very weak medium to high density CHALK. Fractures are not assessed. Drilling marks are visible on the core, possible flint jammed in catcher. Possible drilling induced fractures are randomly orientated very closely spaced undulating rough. (Grade B3) | | | | |
| | | | | | | | | | | . . . at 37.96m small fragments of nodular rounded flint. . . . at 38.00m very small rinded. . . . at 38.00m and 38.50m thinning of core noticed. | | | | |
| | | | | | | | | | | . . . at 38.03m small fragment of nodular flint up to 50mm. | 72[i] | | | |
| | | | | | | | | | | . . . at 38.13m small fragments of rinded flint up to 50mm. | | | | |
| | 80% return Air+Mist (White) | 93 | 70 | 63 | | | | | | . . . at 38.33m wispy marl. | | | | |
| 38.40-38.70 | | | | | NI | 42 | D | | | | | | | |
| | | | | | | | | | | . . . at 38.90m possible bivalve (5mm thick with liner parallel closely spaced ribs) (possible Spardylus Latus). | | | (2.70) | |
| 39.10-40.60 (0:08) 39.10-39.40 | | | | | | 45 | D | | | | | | | |
| | 80% return Air+Mist (White) | 100 | 13 | 0 | | | | | | . . . between 39.16m and 39.28m group of wispy marl. | | | | |
| | | | | | | | | | | . . . between 39.28m and 39.38m occasional brown sponges. | | | | |
| | | | | | | | | | | . . . at 39.40m very small rinded flint up to 30mm. | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450** | **Stuart Crawford** | **IFoster + BSaimen** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 21 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 80% return Air+Mist (White) | 100 | 13 | 0 | | | | | | Weak locally very weak medium to high density CHALK. Fractures are not assessed. Drilling marks are visible on the core, possible flint jammed in catcher. Possible drilling induced fractures are randomly orientated very closely spaced undulating rough. (Grade B3) *(stratum copied from 37.60m from* previous sheet) . . . at 39.53m very small rinded flint up to 20mm. . . . at 40.00m very small rinded nodular flint up to 20mm between 39.60m and 39.80m non intact. . . . at 40.10m very small rinded nodular flint up to 30mm. . . . between 40.12m and 40.20m group of marl up to 3mm. | | 39.33 | 40.30 | |
| 40.50-40.60 | | | | | NI | 46 | D | | | Strong high density white CHALK with occasional wispy marls. (Possible hard ground). (LEWES NODULAR CHALK FORMATION) | | 39.03 | (0.30) 40.60 | |
| 40.60-42.10 (0:06) | 60% return Air+Mist (White) | 0 | 0 | 0 | | | | | | Assumed zone of core loss. | | | | AZCL |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 22 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60% return Air+Mist (White) | 0 | 0 | 0 | | | | | | Assumed zone of core loss. *(stratum copied from 40.60m from* previous sheet) | | | (2.25) | |
| 42.10-42.85 (0:08) | 70% return Air+Mist (White) | 0 | 0 | 0 | NI | | | | | | | | | AZCL |
| 42.85-43.60 (0:05) | | | | | | | | | | | | 36.78 | 42.85 | |
| 43.00-43.20 | 70% return Air+Mist (White) | 100 | 100 | 100 | | 47 | D | | | Very weak locally weak white with black specks CHALK with rare inclusions of medium strong chalk gravel. Fractures are possibly drilling induced 5-55°. (LEWES NODULAR CHALK FORMATION Grade B3) . . . at 43.00m inoceramid (possible *Platyceramus*). *Description on next sheet* | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **R619** |

| Contract Ref: | Start: **20.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **30.04.18** | **79.63** | **E:412785.8 N:141969.2** | **23** of **49** |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | 100 | 100 | | | | | | . . . at 43.45m fragments of possible *Platyceramus*. Very weak locally weak white with black specks CHALK with rare inclusions of medium strong chalk gravel. Fractures are possibly drilling induced 5-55°. (LEWES NODULAR CHALK FORMATION Grade B3) *(stratum copied from 42.85m from* previous sheet) . . . between 43.60m and 43.73m possible hard ground (medium strong chalk). . . . at 43.80m occasional very small fragments of flint up to 20mm. . . . at 43.98m possible fragments of *Platyceramus*. . . . at 44.10m thin band of possible hardrock. . . . between 44.20m and 44.35m occasional shell fragments of inoceramid (possible *Platyceramus*). . . . at 44.30m thin marl up to 1mm. . . . at 44.35m and 44.40m possible hard ground with slickensides. . . . between 44.45m and 44.55m non intact with very small fragments of flint. . . . at 44.50m very small fragments of flint (possible sheet flint up to 30mm thick). | | | (1.85) | |
| 43.60-44.35 (0:06) | | | | | | | | | | | | | | |
| 43.80-44.00 | | | | | | 48 | D | | | | | | | |
| | 70% return Air+Mist (White) | 100 | 100 | 100 | NI | | | | | | | | | |
| 44.35-44.70 (0:03) | | | | | | | | | | | | | | |
| | 60% return Air+Mist (White) | 86 | 34 | 0 | | | | | | | | | | |
| 44.60-44.70 | | | | | | 49 | D | | | | | 34.93 | 44.70 | |
| 44.70-45.10 (0:05) | | | | | | | | | | Weak locally very weak brown stained CHALK with nodular flint. Fracture set 1: Fractures are 5° closely to medium spaced undulating rough open with brown staining (40/200/770). Single fracture at 45.56m 20° undulating rough open with black specks. (LEWES NODULAR CHALK FORMATION Grade B3) . . . at 44.70m thick marl up to 10mm. . . . between 44.86m and 44.90m very small fragments of nodular rinded flint. . . . at 44.95m thick marl up to 5mm. . . . at 45.00m group of thin marls up to 2mm. . . . between 45.10m and 45.44m non intact recovered as angular fine o coarse gravel size chalk and rinded nodular flint (possible flint band). | 73[i] 74[i] | | (1.15) | |
| | 60% return Air+Mist (White) | 100 | 80 | 0 | | | | | | | | | | |
| 44.90-45.10 | | | | | | 50 | D | | | | | | | |
| | | | | | NI | | | | | | | | | |
| 45.10-45.85 (0:05) | | | | | NI 180 | | | | | | | | | |
| | 60% return Air+Mist (White) | 89 | 25 | 17 | | | | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450** | **Stuart Crawford** | **IFoster + BSaimen** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 24 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45.50-45.70 | 60% return Air+Mist (White) | 89 | 25 | 17 | NI NI 180 | 51 | D | | | . . . at 45.72m nodular lenticular flint up to 20mm embedded in grey brown chalk. | 75[i] 76[i] | | | |
| 45.85-46.60 (0:04) | 60% return Air+Mist (White) | 100 | 87 | 87 | | | | | | . . . at 45.77m nodular/lenticular white chalk fragments upo to 10mm embedded in light grey and chalk. Weak high density white CHALK with occasional wispy and thick marl and nodular flint. Fracture set 1: Bedding fractures are 5° closely to widely spaced undulating rough partly open to open clean or infilled with fine chalk fragments (100/280/1500). Fracture set 2: Fractures are 15-25° closely spaced undulating open infilled with fine fragments of chalk (140/140/1300). (LEWES NODULAR CHALK FORMATION Grade B2) . . . between 46.07m and 46.28m group of wispy thick marl up to 3mm with nodular chalk. . . . at 46.48m fragments of inoceramid (possible *Platyceramus*). | | 33.78 | 45.85 | |
| 46.60-48.10 (0:06) 46.65-47.05 | 60% return Air+Mist (White) | 100 | 75 | 65 | NI 300 450 | 52 | U | | | . . . between 47.04m and 47.14m small fragments of rinded flint up to 70mm. . . . at 47.20m marl up to 4mm. . . . at 47.27m marl up to 3mm. . . . at 47.32m marl up to 5mm. . . . between 47.32m and 47.37m recovered non intact as angular fine to coarse fragments of chalk. | 77[i] 78[i] 79[i] | | (2.25) | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R619 |

| Contract Ref: | Start: 20.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.63 | E:412785.8 N:141969.2 | 25 of 49 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47.60-47.80 | 60% return Air+Mist (White) | 100 | 75 | 65 | NI 300 450 | 53 | D | | | Weak high density white CHALK with occasional wispy and thick marl and nodular flint. Fracture set 1: Bedding fractures are 5° closely to widely spaced undulating rough partly open to open clean or infilled with fine chalk fragments (100/280/1500). Fracture set 2: Fractures are 15-25° closely spaced undulating open infilled with fine fragments of chalk (140/140/1300). (LEWES NODULAR CHALK FORMATION Grade B2) *(stratum copied from 45.85m from* previous sheet) . . . at 47.64m very small nodular rinded flint. | 80[i] 81[i] | 31.53 | 48.10 | |
| | | | | | | | | | | . . . between 47.74m and 47.82m small rinded flint up to 55mm. . . . at 47.95m thick marl up to 6mm. Borehole terminated at 48.10m depth. | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450 | Stuart Crawford | IFoster + BSaimen | |

**Appendix 5: R620 Borehole Log**

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 1 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of chalk and flint. | | | (0.30) | |
| | | | | | | | | | | | | 79.32 | 0.30 | |
| | | | | | | | | | | Cream to pale brown slightly gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse flint and chalk. POSSIBLY PHOSPHATIC CHALK. | | | (0.20) | |
| | | | | | | | | | | | | 79.12 | 0.50 | |
| 0.50 | | | | | | 1 | D | | | Cream to pale brown slightly gravelly silty fine to coarse SAND with low cobble content. Gravel is angular to subrounded fine to coarse flint and chalk. Cobbles are subangular to subrounded flint. POSSIBLY PHOSPHATIC CHALK. | | | | |
| 0.60 | | | | | | 101 | ES | | | | | | (0.70) | |
| | | | | | | | | | | | | 78.42 | 1.20 | |
| 1.20-2.70 (0:01) | 100% return Water (White) | 60 | 0 | 0 | | | | | | Brown sandy silty angular to subrounded GRAVEL. Gravel is angular to subrounded fine to coarse white chalk and flint. Sand is fine to coarse. POSSIBLY PHOSPHATIC CHALK. | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 25/04/18 | 17:00 | 6.40 | 1.70 | 146 | 5.20 |
| 26/04/18 | 08:20 | 6.40 | 1.70 | 146 | 5.20 |
| 26/04/18 | 17:30 | 21.15 | 12.10 | 146 | 9.72 |
| 27/04/18 | 09:00 | 21.15 | 12.10 | 146 | 5.90 |
| 27/04/18 | 16:30 | 42.30 | 12.10 | 146 | 21.40 |
| 30/04/18 | 08:30 | 42.30 | 12.10 | 146 | 5.10 |
| 30/04/18 | 16:00 | 48.30 | 12.10 | 146 | 5.20 |

## General Remarks

1. Location CAT scanned prior to excavation.
2. Inspection pit excavated by Archaeologists to 0.90m.
3. Hand dug inspection pit to 1.20m depth on 27/03/2018.
4. No groundwater strikes noted by the driller.
5. Borehole drilled using a 146mm geobore S core barrel and air mist as the flush medium.
6. 50mm PVC groundwater monitoring pipe installed as shown.

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 2 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Water (White) | 60 | 0 | 0 | | | | | | Brown sandy silty angular to subrounded GRAVEL. Gravel is angular to subrounded fine to coarse white chalk and flint. Sand is fine to coarse. POSSIBLY PHOSPHATIC CHALK. *(stratum copied from 1.20m from* previous sheet) | | | (1.50) | |
| | | | | | | | | | | . . . at 2.60m small cobble sized flint up to 60mm. | | 76.92 | 2.70 | |
| 2.70-4.20 (0:01) | 100% return Water (White) | 100 | 0 | 0 | | | | | | Structureless CHALK composed of slightly sandy silty subangular to rounded GRAVEL of white medium density chalk. Gravel is subangular to rounded fine to coarse medium to high density chalk. (Grade Dc) | | | | |
| 3.40-3.60 | | | | | | 5 | D | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 3 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Water (White) | 100 | 0 | 0 | | | | | | Structureless CHALK composed of slightly sandy silty subangular to rounded GRAVEL of white medium density chalk. Gravel is subangular to rounded fine to coarse medium to high density chalk. (Grade Dc) *(stratum copied from 2.70m from* previous sheet) | | | | |
| 4.20-4.90 (0:01) | | | | | | | | | | . . . at 4.05m very small fine to coarse fragments rinded nodular flint up to 20mm. | | | | |
| | 100% return Water (White) | 86 | 0 | 0 | | | | | | | | | (3.70) | |
| 4.90-6.40 (0:01) | | | | | | | | | | . . . at 4.70m very small nodular rinded flint up to 20mm. | | | | |
| | 100% return Air+Mist (White) | 100 | 0 | 0 | | | | | | | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 4 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Structureless CHALK composed of slightly sandy silty subangular to rounded GRAVEL of white medium density chalk. Gravel is subangular to rounded fine to coarse medium to high density chalk. (Grade Dc) *(stratum copied from 2.70m from* previous sheet) . . . below 5.60m chalk fragments are weak high density. | | | | |
| 6.00-6.20 | 100% return Air+Mist (White) | 100 | 0 | 0 | | 6 | D | | | | | | | |
| | | | | | | | | | | | | 73.22 | 6.40 | |
| 6.40-7.15 (0:01) | 70% return Air+Mist (White) | 100 | 0 | 0 | | | | | | Very weak medium density white CHALK. Fractures are randomly orientated extremely to very closely spaced undulating rough partly open to moderately wide infilled with comminuted chalk up to 3.5mm with brown staining. (Grade C5) | | | | |
| | | | | | | | | | | . . . at 7.10m very small rinded flint. | | | (1.50) | |
| 7.15-7.90 (0:01) | 65% return Air+Mist (White) | 87 | 0 | 0 | | | | | | | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 5 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.50-7.70 | 65% return Air+Mist (White) | 87 | 0 | 0 | | 7 | D | | | Very weak medium density white CHALK. Fractures are randomly orientated extremely to very closely spaced undulating rough partly open to moderately wide infilled with comminuted chalk up to 3.5mm with brown staining. (Grade C5) *(stratum copied from 6.40m from* previous sheet) | | 71.72 | 7.90 | |
| 7.90-9.40 (0:01) | 50% return Air+Mist (Brown) | 60 | 0 | 0 | | | | | | Structureless CHALK composed of slightly sandy silty angular to subangular fine to coarse GRAVEL. Gravel is medium density white chalk and rare flint. (Grade Dc) | | | | |
| | | | | | | | | | | . . . at 8.90m very small fragment of flint. | | | (2.25) | |
| 9.40-10.15 (0:01) | 50% return Air+Mist | 40 | 0 | 0 | | | | | | . . . at 9.40m small rinded flint up to 55mm. | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 6 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (White) | | | | | | | | | Structureless CHALK composed of slightly sandy silty angular to subangular fine to coarse GRAVEL. Gravel is medium density white chalk and rare flint. (Grade Dc) *(stratum copied from 7.90m from* previous sheet) | | | | |
| | 50% return Air+Mist (White) | 40 | 0 | 0 | | | | | | | | 69.47 | 10.15 | |
| 10.15-10.90 (0:01) | | | | | | | | | | Partial recovery. Recovery comprises structureless CHALK composed of cream slightly gravelly sandy SILT. Gravel is very weak medium density white with subangular to subrounded. No evidence of bedding or discontinuities. (Grade Dm) | | | | |
| | 50% return Air+Mist (Brown) | 67 | 0 | 0 | | | | | | | | | (1.31) | |
| 10.90-11.65 (0:01) | | | | | | | | | | . . . occasional very small fragments of rinded flint up to 40mm (possible flint band). | | | | |
| 11.20-11.40 | 50% return Air+Mist (White) | 40 | 0 | 0 | NI 40 130 | 8 | D | | | | | 68.16 | 11.46 | |
| | | | | | | | | | | *Description on next sheet* | 1[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 7 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11.65-12.15 (0:01) 11.65-11.85 | 50% return Air+Mist (White) | 40 | 0 | 0 | NI | 9 | D | | | Partial recovery. Recovery comprises very weak medium density white black specks CHALK. Fracture set 1: Bedding fractures are 5° closely spaced planar and undulating rough open with brown discolouration and frequent comminuted chalk infill (40/60/350). Fracture set 2: Fractures are 25-45° closely spaced undulating rough partly open with black specks and are comminuted chalk infill. (120/140/215). (Grade C4) *(stratum copied from 11.46m from* previous sheet) . . . at 11.90m occasional fragments of slightly inflated incceramids up to 3mm thick. . . . between 12.05m and 12.15m non intact recovered as angular fine to coarse gravel size chalk. . . . at 12.10m occasional brown stained sponges. | 2[i] 3[i] 4[i] 5[i] 6[i] | | (0.69) | |
| | 50% return Air+Mist (White) | 80 | 24 | 24 | 40 130 | | | | | | | 67.47 | 12.15 | |
| 12.15-13.65 (0:01) | 100% return Air+Mist (White) | 7 | 0 | 0 | NI | | | | | Minimal recovery. Recovery comprises very strong black angular fine to coarse flint gravel. | | | (1.50) | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 8 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (White) | 7 | 0 | 0 | | | | | | Minimal recovery. Recovery comprises very strong black angular fine to coarse flint gravel. *(stratum copied from 12.15m from previous sheet)* | | 65.97 | 13.65 | |
| 13.65-14.40 (0:01) | | | | | | | | | | Weak high density white with black specks and light brown CHALK. Fracture set 1: Fractures are 10-20° closely to medium spaced planar rough partly open to open with brown staining black specks and occasional comminuted chalk infill. Fracture set 2: Fractures are 35-50° very closely to medium spaced planar rough partly open with black specks (40/220/830). Fracture set 3: Fractures are 60° widely spaced planar rough open with brown staining (1800/2500/2885). Single fracture at 16.05 85° planar rough partly open with black specks. (Grade C3) | 7[i] | | | |
| 13.85-14.00 | | | | | | 10 | D | | | | 8[i] 9[i] 10[i] 11[i] | | | |
| | 100% return Air+Mist (Brown) | 80 | 11 | 0 | NI | | | | | | | | | |
| 14.40-15.15 (0:01) | | | | | | | | | | . . . between 14.0m and 14.10m recovered as fine to coarse gravel size clasts. . . . between 14.10m and 14.35m recovered as cobble sized fragments of chalk with light brown discolouration on fracture surface. | 12[i] 13[i] | | | |
| | 100% return Air+Mist (White) | 107 | 59 | 49 | | | | | | | 14[i] 15[i] | | | |
| 14.85-15.00 | | | | | | 11 | U | | | | | | | |
| 15.00-15.15 | | | | | NI 150 220 | 12 | D | | | . . . between 14.95m and 15.15m non intact recovered as cobble sized chalk with light brown stained fracture surface. . . . at 15.05m finger shaped very small rinded flint. . . . at 15.05m and 15.15m locally chalk becomes very weak. . . . at 15.10m finger shaped rinded flint up to 15mm thick. | | | | |
| 15.15-16.65 (0:01) | | | | | | | | | | | 16[i] | | (3.10) | |
| | 100% return Air+Mist (White) | 100 | 43 | 23 | | | | | | | | | | |
| 15.35-15.65 | | | | | | 13 | U | | | | 17[i] | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 9 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16.45-16.65 | 100% return Air+Mist (White) | 100 | 43 | 23 | NI 150 220 | 14 | D | | | Weak high density white with black specks and light brown CHALK. Fracture set 1: Fractures are 10-20° closely to medium spaced planar rough partly open to open with brown staining black specks and occasional comminuted chalk infill. Fracture set 2: Fractures are 35-50° very closely to medium spaced planar rough partly open with black specks (40/220/830). Fracture set 3: Fractures are 60° widely spaced planar rough open with brown staining (1800/2500/2885). Single fracture at 16.05 85° planar rough partly open with black specks. (Grade C3) *(stratum copied from 13.65m from* previous sheet) . . . between 15.90m and 16.17m non intact recovered as fine to coarse gravel sized fragments of flint and chalk up to 60mm. . . . between 15.93m and 16.05m medium fragment of rinded flint up to 60mm (possible flint band). . . . at 16.23m wispy marl up to 1mm. | 18[i] 19[i] 20[i] 21[i] 22[i] 23[i] | | | |
| 16.65-18.15 (0:01) 16.65-16.85 | 100% return Air+Mist (Brown) | 100 | 65 | 55 | NI 225 440 | 15 | D | | | | | 62.87 | 16.75 | |
| | | | | | | | | | | Very weak to weak medium to high density CHALK with occasional brown stained sponges and rare echinoids. Fracture set 1: Fractures are 5-20° medium to widely spaced undulating rough open to moderately open with rare brown staining and occasionally infilled with chalk fragments (140/550/1480). Fracture set 2: Fractures are medium to widely spaced undulating rough to striated open with black specks and occasional slickensides (200/400/1530). Single fracture at 16.93m 40° planar rough open with light brown staining and black specks. (Grade C2) . . . at 16.80m wispy marl up to 1mm. *Description on next sheet* | 24[i] 25[i] 26[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 10 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (Brown) | 100 | 65 | 55 | | | | | | . . . between 17.25m and 17.40m occasional brown stained sponges. Very weak to weak medium to high density CHALK with occasional brown stained sponges and rare echinoids. Fracture set 1: Fractures are 5-20° medium to widely spaced undulating rough open to moderately open with rare brown staining and occasionally infilled with chalk fragments (140/550/1480). Fracture set 2: Fractures are medium to widely spaced undulating rough to striated open with black specks and occasional slickensides (200/400/1530). Single fracture at 16.93m 40° planar rough open with light brown staining and black specks. (Grade C2) | 27[i] 28[i] | | | |
| 18.05-18.15 | | | | | | 16 | D | | | | | | | |
| 18.15-19.65 (0:01) 18.15-18.25 | | | | | NI 225 440 | 17 | D | | | *(stratum copied from 16.75m from* previous sheet) . . . between 17.50m and 17.62m brown stained sponges. . . . at 17.60m fragments of echinoids (possible *Micraster*). . . . between 17.70m and 17.82m brown stained sponges. . . . at 18.00m fragments of inflated echinoids, possible *Micraster*. | 29[i] | | | |
| | 100% return Air+Mist (Brown) | 87 | 50 | 50 | | | | | | . . . between 18.65m and 18.85m recovered as angular fine to coarse gravel sized chalk and flint. . . . between 18.80m and 18.85m possible minor fault with polished and slickensided surface. | 30[i] | | (4.40) | |
| 19.00-19.20 | | | | | | 18 | D | | | | | | | |
| | | | | | | | | | | . . . between 19.22m and 19.35m possible minor fault with polished and slickensided surface. | 31[i] 32[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 11 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (Brown) | 87 | 50 | 50 | | | | | | Very weak to weak medium to high density CHALK with occasional brown stained sponges and rare echinoids. Fracture set 1: Fractures are 5-20° medium to widely spaced undulating rough open to moderately open with rare brown staining and occasionally infilled with chalk fragments (140/550/1480). Fracture set 2: Fractures are medium to widely spaced undulating rough to striated open with black specks and occasional slickensides (200/400/1530). Single fracture at 16.93m 40° planar rough open with light brown staining and black specks. (Grade C2) *(stratum copied from 16.75m from* previous sheet) | | | | |
| 19.65-20.55 (0:01) 19.65-20.00 | | | | | | 19 | U | | | | | | | |
| | 100% return Air+Mist (White) | 100 | 99 | 99 | | | | | | | | | | |
| 20.20-20.40 | | | | | NI 225 440 | 20 | D | | | . . . at 19.68m group of wispy marl up to 1mm. . . . between 19.75m and 20.30m frequent brown stained sponges. | | | | |
| 20.55-21.15 (0:01) 20.60-20.80 | | | | | | 21 | D | | | . . . at 20.67m occasional brown sponges. | 33[i] | | | |
| | 100% return Air+Mist (White) | 100 | 70 | 60 | | | | | | . . . at 20.90m very small fragments of rinded nodular flint. | | | | |
| | | | | | | | | | | | | 58.47 | 21.15 | |
| 21.15-22.65 (0:01) | | | | | | | | | | *Description on next sheet* | | | | |
| | 100% return Air+Mist (White) | 100 | 84 | 80 | NI 240 750 | | | | | | | | | |
| 21.35-21.50 | | | | | | 22 | D | | | | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 12 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22.15-22.40 | 100% return Air+Mist (White) | 100 | 84 | 80 | NI 240 750 | 23 | U | | | Weak high density white black specks CHALK with rare brown stained sponges and rare wispy marls. Fracture set 1: Bedding fractures are 5-25° medium to widely spaced planar rough and undulating rough partly open to open with black specks and brown staining (230/800/1990). Fracture set 2: Fractures are 40-50° closely to widely spaced undulating rough and planar rough partly open to open with brown staining and black specks (50/400/2725). Fracture set 3: Fractures are 60-70° widely spaced open with black specks and brown staining (900/1200/4935) (Grade C2) *(stratum copied from 21.15m from* previous sheet) | 34[i] 35[i] 36[i] 37[i] | | | |
| 22.65-24.15 (0:01) 22.65-22.90 | 100% return Air+Mist (White) | 100 | 81 | 78 | | 24 | U | | | . . . at 22.50m very small nodular flint. . . . at 22.73m rinded brown sponges. . . . at 22.90m very small tabular flint. | 38[i] 39[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 13 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23.75-23.90 | 100% return Air+Mist (White) | 100 | 81 | 78 | | 25 | D | | | Weak high density white black specks CHALK with rare brown stained sponges and rare wispy marls. Fracture set 1: Bedding fractures are 5-25° medium to widely spaced planar rough and undulating rough partly open to open with black specks and brown staining (230/800/1990). Fracture set 2: Fractures are 40-50° closely to widely spaced undulating rough and planar rough partly open to open with brown staining and black specks (50/400/2725). Fracture set 3: Fractures are 60-70° widely spaced open with black specks and brown staining (900/1200/4935) (Grade C2) | 40[i] | | | |
| 24.15-25.65 (0:01) | | | | | | | | | | *(stratum copied from 21.15m from* previous sheet) | | | | |
| 24.25-24.55 | | | | | | 26 | U | | | . . . at 23.53m brown sponges. . . . at 23.67m wispy marl. . . . at 24.00m medium fragment of flint (possible flint band). | | | | |
| | | | | | NI 240 750 | | | | | . . . at 24.48m fragments of echinoids (possible micraster). | 41[i] | | | |
| | 100% return Air+Mist (White) | 100 | 100 | 63 | | | | | | . . . at 24.85m very small rinded nodular flint. | | | | |
| | | | | | | | | | | . . . at 25.02m brown sponges. | 42[i] | | | |
| 25.35-25.55 | | | | | | 27 | D | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 14 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (White) | 100 | 100 | 63 | | | | | | Weak high density white black specks CHALK with rare brown stained sponges and rare wispy marls. Fracture set 1: Bedding fractures are 5-25° medium to widely spaced planar rough and undulating rough partly open to open with black specks and brown staining (230/800/1990). Fracture set 2: Fractures are 40-50° closely to widely spaced undulating rough and planar rough partly open to open with brown staining and black specks (50/400/2725). Fracture set 3: Fractures are 60-70° widely spaced open with black specks and brown staining (900/1200/4935) (Grade C2) *(stratum copied from 21.15m from* previous sheet) | 43[i] | | (8.85) | |
| 25.65-27.15 (0:01) 25.65-26.00 | | | | | | 28 | D | | | | | | | |
| | 100% return Air+Mist (White) | 87 | 47 | 45 | NI 240 750 | | | | | | 44[i] 45[i] 46[i] | | | |
| 26.70-27.00 | | | | | | 29 | U | | | | 47[i] | | | |
| | | | | | | | | | | | 48[i] | | | |
| 27.15-28.65 (0:01) 27.15-27.35 | 100% return Air+Mist (White) | 100 | 73 | 60 | | 30 | D | | | . . . at 27.15m thin marl up to 2mm and wispy marl. | | | | |

Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

**DRAFT**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **R620** |

| Contract Ref: | Start: **25.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **30.04.18** | **79.62** | **E:412752.2 N:141959.2** | **15** of **47** |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27.80-28.00 | 100% return Air+Mist (White) | 100 | 73 | 60 | NI 240 750 | 31 | D | | | Weak high density white black specks CHALK with rare brown stained sponges and rare wispy marls. Fracture set 1: Bedding fractures are 5-25° medium to widely spaced planar rough and undulating rough partly open to open with black specks and brown staining (230/800/1990). Fracture set 2: Fractures are 40-50° closely to widely spaced undulating rough and planar rough partly open to open with brown staining and black specks (50/400/2725). Fracture set 3: Fractures are 60-70° widely spaced open with black specks and brown staining (900/1200/4935)<br>(Grade C2)<br>*(stratum copied from 21.15m from* previous sheet)<br>. . . at 27.50m occasional brown sponges.<br>. . . at 27.55m small rinded nodular flint.<br>. . . at 28.00m possible thin walled incceramids with thin slightly rinded concentric ribs and growth lines, possible *Platyceramus*.<br>. . . at 28.50m very small rinded nodular flint. | 49[i]<br>50[i] | | | |
| 28.65-30.15 (0:01) 28.65-28.80 | 100% return Air+Mist (White) | 100 | 89 | 87 | | 32 | D | | | | 51[i] | | | |
| 29.35-29.80 | | | | | | 33 | U | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Lee Harris** | **IFoster + BSaimen** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 16 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (White) | 100 | 89 | 87 | NI 240 750 | | | | | Weak high density white black specks CHALK with rare brown stained sponges and rare wispy marls. Fracture set 1: Bedding fractures are 5-25° medium to widely spaced planar rough and undulating rough partly open to open with black specks and brown staining (230/800/1990). Fracture set 2: Fractures are 40-50° closely to widely spaced undulating rough and planar rough partly open to open with brown staining and black specks (50/400/2725). Fracture set 3: Fractures are 60-70° widely spaced open with black specks and brown staining (900/1200/4935) (Grade C2) *(stratum copied from 21.15m from* previous sheet) . . . at 29.60m fragments of possible *Platyceramus*. | 52[i] 53[i] 54[i] | 49.62 | 30.00 | |
| 30.15-31.65 (0:01) | | | | | | | | | | Weak high density white with occasional black specks CHALK. Fracture set 1: Bedding fractures are 5-10° medium to widely spaced undulating rough partly open with black specks (490/750/1900). Fracture set 2: Fractures are 40-65° medium to widely spaced undulating rough open with black specs and light brown staining and rare slickensides. (Grade B2) . . . at 30.03m wispy marl. . . . at 30.17m wispy or streaky marl with rare phosphatic nodules up to 5mm. . . . at 30.30m group of wispy marl. . . . at 30.55m wispy marl. | 55[i] | | | |
| 30.50-30.90 | 100% return Air+Mist (Brown) | 100 | 90 | 83 | NI 300 580 | 34 | U | | | . . . at 31.00m wispy marl up to 1mm and occasional fragments of possible *Platyceramus* with subparallel ribs. . . . at 31.05m fragments of shell with tight narrow radiating ribs. . . . at 31.08m possible innceremids shell fragments. . . . at 31.30m branching rinded flint. . . . between 31.35m and 31.42m possible minor fault with polished and slickenside surface. | 56[i] 57[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 17 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31.50-31.65 | 100% return Air+Mist (Brown) | 100 | 90 | 83 | | 35 | D | | | Weak high density white with occasional black specks CHALK. Fracture set 1: Bedding fractures are 5-10° medium to widely spaced undulating rough partly open with black specks (490/750/1900). Fracture set 2: Fractures are 40-65° medium to widely spaced undulating rough open with black specs and light brown staining and rare slickensides. (Grade B2) *(stratum copied from 30.00m from* previous sheet) . . . at 31.70m occasional fragments of possible *Platyceramus* with subparallel ribs. . . . at 31.90m possible thin band up to 5cm of brown phosphatic chalk. . . . at 31.95m possible *Platyceramus*. . . . at 32.0m medium gravel to cobble size flints. | | | | |
| 31.65-33.15 (0:01) | | | | | | | | | | | | | | |
| 31.90-32.05 | | | | | | 36 | D | | | | 58[i] | | | |
| 32.40-32.65 | 100% return Air+Mist (Brown) | 83 | 55 | 47 | NI 300 580 | 37 | D | | | | | | | |
| 33.15-34.65 (0:01) | | | | | | | | | | . . . at 33.00m and 33.05m wispy marl up to 1mm. . . . at 33.15m possible incceramids (*Platyceramus*). | 59[i] | | (6.15) | |
| 33.35-33.75 | 100% return Air+Mist (Brown) | 100 | 83 | 83 | | 38 | U | | | . . . at 33.40m marl seam up to 10mm. | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 18 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Weak high density white with occasional black specks CHALK. Fracture set 1: Bedding fractures are 5-10° medium to widely spaced undulating rough partly open with black specks (490/750/1900). Fracture set 2: Fractures are 40-65° medium to widely spaced undulating rough open with black specs and light brown staining and rare slickensides. (Grade B2) *(stratum copied from 30.00m from* previous sheet) | 60[i] | | | |
| 34.00-34.35 | 100% return Air+Mist (Brown) | 100 | 83 | 83 | NI 300 580 | 39 | D | | | . . . at 33.50m occasional fragments of incceramids (possible *Platyceramus*). . . . at 33.80m group of marl seam up to 50mm and wispy marl. . . . at 33.97m very small nodular rinded flint. | 61[i] | | | |
| 34.65-36.15 (0:01) | | | | | | | | | | . . . at 34.58m marl seam up to 15mm. . . . between 34.65m and 34.75m small fragments of flint. | | | | |
| 34.75-35.00 | | | | | | 40 | D | | | . . . at 34.75m possible incceramid fragments. | | | | |
| | 100% return Air+Mist (Brown) | 91 | 53 | 47 | | | | | | . . . at 35.10m rare brown phosphatic nodules up to 10mm. . . . at 35.20m sheet flint up to 10mm along a fracture dipping at 45°. . . . at 35.30m possible incceramids possible *Platyceramus* with subparallel ribs. | 62[i] | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 19 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35.90-36.15 | 100% return Air+Mist (Brown) | 91 | 53 | 47 | NI 300 580 | 41 | D | | | Weak high density white with occasional black specks CHALK. Fracture set 1: Bedding fractures are 5-10° medium to widely spaced undulating rough partly open with black specks (490/750/1900). Fracture set 2: Fractures are 40-65° medium to widely spaced undulating rough open with black specs and light brown staining and rare slickensides. (Grade B2) *(stratum copied from 30.00m from* previous sheet) . . . at 35.80m and 35.89m possible minor fault infilled with fragmented chalk. | 63[i] 64[i] 65[i] | | | |
| 36.15-36.55 (0:01) | | | | | | | | | | | | 43.47 | 36.15 | |
| 36.25-36.30 | 100% return Air+Mist (Brown) | 100 | 0 | 0 | NI | 42 | D | | | Weak to medium strong very high density white CHALK with occasional inoceramids shell fragments. Recovered as gravel and cobbles. | | | (0.40) | |
| 36.55-37.80 (0:01) | | | | | | | | | | | | 43.07 | 36.55 | |
| 36.75-37.25 | 100% return Air+Mist (White) | 100 | 100 | 92 | NI 400 480 | 43 | U | | | Weak high density white CHALK with rare wispy marls and hard gravels. Fracture set 1: Bedding fractures are 5-15° widely spaced undulating rough open with brown discolouration and rare comminuted chalk infill (1170/1330/2042). Fracture set 2: Fractures are 40-65° widely spaced with brown staining (130/1000/2870). (Grade C2) . . . at 36.55m very small nodular fragments of flint. . . . between 36.55m and 36.65m group of wispy marl. . . . between 37.20m and 37.27m possible hard ground. | 66[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 20 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100% return Air+Mist (White) | 100 | 100 | 92 | | | | | | Weak high density white CHALK with rare wispy marls and hard gravels. Fracture set 1: Bedding fractures are 5-15° widely spaced undulating rough open with brown discolouration and rare comminuted chalk infill (1170/1330/2042). Fracture set 2: Fractures are 40-65° widely spaced with brown staining (130/1000/2870). (Grade C2) | | | | |
| 37.80-39.30 (0:01) 37.80-38.25 | | | | | | 44 | U | | | . . . at 36.55m very small nodular fragments of flint. . . . between 36.55m and 36.65m group of wispy marl.*(stratum copied* from 36.55m from previous sheet) . . . at 37.50m fragments of possible incceramids, possible *Platyceramus*. . . . at 37.66m very small rinded flint nodular. . . . at 37.76m very small rinded flint nodular. . . . at 37.84m very small rinded flint. . . . at 38.20m very small rinded nodular flint. | | | | |
| | 100% return Air+Mist (White) | 93 | 73 | 73 | NI 400 480 | | | | | | 67[i] | | | |
| 39.10-39.30 | | | | | | 45 | D | | | . . . at 38.80m very small nodular flint. | | | | |
| 39.30-40.80 (0:01) 39.35-39.65 | 100% return Air+Mist (White) | 100 | 89 | 7 | | 46 | U | | | . . . between 38.92m and 39.12m non intact recovered as fine to coarse gravel sized chalk. | 68[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 21 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40.20-40.40 | 100% return Air+Mist (White) | 100 | 89 | 7 | NI 400 480 | 47 | D | | | . . . at 39.47m wispy marl. Weak high density white CHALK with rare wispy marls and hard gravels. Fracture set 1: Bedding fractures are 5-15° widely spaced undulating rough open with brown discolouration and rare comminuted chalk infill (1170/1330/2042). Fracture set 2: Fractures are 40-65° widely spaced with brown staining (130/1000/2870). (Grade C2) . . . at 36.55m very small nodular fragments of flint. . . . between 36.55m and 36.65m group of wispy marl.*(stratum copied* from 36.55m from previous sheet) . . . at 39.50m occasional rounded brown sponge. . . . at 39.75m small rinded nodular flint up to 55mm. . . . at 39.90m occasional shells of fossil (possibly incceramids - with subparallel ribs. . . . between 40.17m and 40.27m four thick marl seams between 5 and 15mm. | | | (7.95) | |
| 40.80-42.30 (0:01) | | | | | | | | | | . . . at 40.55m occasional brown stained sponges. . . . at 40.60m very small nodular rinded flint up to 20mm and fragments of possible *Spordylus* Latus *or* Plagiostomata. . . . at 40.70m very small rinded flint up to 15mm. . . . at 40.85m and 40.95m non intact recovered as fine to coarse gravel sized fragments of chalk. | | | | |
| 41.20-41.45 | 100% return Air+Mist (White) | 93 | | 74 | | 48 | D | | | . . . between 41.00m and 41.25m group of thick marl and wispy marl up to 10mm with nodules of white chalk. | 69[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **R620** |

| Contract Ref: | Start: **25.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **30.04.18** | **79.62** | **E:412752.2 N:141959.2** | **22** of **47** |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41.60-41.90 | 100% return Air+Mist (White) | 93 | | 74 | | 49 | U | | | Weak high density white CHALK with rare wispy marls and hard gravels. Fracture set 1: Bedding fractures are 5-15° widely spaced undulating rough open with brown discolouration and rare comminuted chalk infill (1170/1330/2042). Fracture set 2: Fractures are 40-65° widely spaced with brown staining (130/1000/2870). (Grade C2)<br>. . . at 36.55m very small nodular fragments of flint.<br>. . . between 36.55m and 36.65m group of wispy marl.*(stratum copied* from 36.55m from previous sheet)<br>. . . at 41.80m and 41.83m marl seam up to 10mm with wispy marl.<br><br>. . . at 42.13m very small rinded nodular flint. | 70[i] | | | |
| 42.30-43.80 (0:01) 42.30-42.55 | | | | | NI 400 480 | 50 | D | | | . . . between 42.55m and 42.63m very small rinded branching flint. | 71[i] | | | |
| | | | | | | | | | | . . . at 42.75m and 42.90m possible minor fault with slickensides. | 72[i] | | | |
| 43.00-43.35 | 100% return Air+Mist (Brown) | 100 | 73 | 73 | | 51 | U | | | . . . at 42.95m thick mark up to 20mm. | 73[i] | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Lee Harris** | **IFoster + BSaimen** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 23 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 43.80-45.30 (0:01) | 100% return Air+Mist (Brown) | 100 | 73 | 73 | NI 400 480 | | | | | Weak high density white CHALK with rare wispy marls and hard gravels. Fracture set 1: Bedding fractures are 5-15° widely spaced undulating rough open with brown discolouration and rare comminuted chalk infill (1170/1330/2042). Fracture set 2: Fractures are 40-65° widely spaced with brown staining (130/1000/2870). (Grade C2)<br>. . . at 36.55m very small nodular fragments of flint.<br>. . . between 36.55m and 36.65m group of wispy marl.*(stratum copied* from 36.55m from previous sheet)<br>. . . at 43.63m occasional fragments of fossil possible *Platyceramus* with subparallel ribs.<br>. . . at 43.71m and 43.725m thick marl up to 15mm.<br>. . . at 44.05m rinded flint. | 74[i]<br>75[i] | | | |
| 44.30-44.50 | | | | | | 52 | D | | | | | 35.12 | 44.50 | |
| | 100% return Air+Mist (Brown) | 100 | 66 | 52 | NI 30 90 | | | | | Weak high to very density white slightly nodular CHALK with occasional thick and wispy marl and occasional flints. Bedding fractures are 5-25° very close to closely spaced undulating rough open clean with rare fragmented chalk infill (50/70/130). (Grade C3)<br>. . . between 44.54m and 44.60m single flint nodule fills whole diameter of core . All edges have been cored. Possible solid flint layer.<br>. . . at 44.86m and 44.95m very small rinded tabular flint.<br>. . . at 44.90m occasional fragments of fossils possible *Platyceramus* with parallel ribs. | 76[i]<br>77[i]<br>78[i]<br>79[i]<br>80[i] | | (0.70) | |
| 45.10-45.30 | | | | | | 53 | D | | | | | 34.42 | 45.20 | |
| 45.30-46.80 (0:01) | 100% return Air+Mist (Brown) | 100 | 77 | 65 | 200 600 | | | | | *Description on next sheet*<br>. . . at 45.30m group of wispy marl.<br>*Description on next sheet* | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 24 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | . . . at 45.45m thick marl up to 50mm. Weak high to very high density white slightly nodular CHALK with occasional thick and wispy marl. Fracture set 1: Fractures are 15-25° closely to widely spaced undulating rough partly open clean with occasional comminuted chalk infill (180/300/1640). Fracture set 2: Fractures are 45-60° widely spaced undulating rough to striated partly open to open with brown stained surfaces with slickensides and rare black specks. (Grade C3) *(stratum copied from 45.20m from* previous sheet) | 81[i] | | | |
| 45.80-46.00 | | | | | | 54 | D | | | | 82[i] | | | |
| 46.00-46.40 | | | | | | 55 | U | | | | | | | |
| | 100% return Air+Mist (Brown) | 100 | 77 | 65 | 200 600 | | | | | . . . at 45.55m group of wispy marl. . . . at 45.72m very small nodular flint. . . . at 45.80m very small up to 40mm nodular flint. . . . at 45.85m thin marls up to 10mm and wispy marl. . . . between 46.00m and 46.30m occasional wispy marl up to 5mm. . . . between 46.10m and 46.35m wispy marl. . . . between 46.50m and 46.92m thick marl up to 50mm with nodular white chalk. | 83[i] | | (3.10) | |
| 46.80-48.30 (0:01) | | | | | | | | | | | | | | |
| 47.05-47.25 | | | | | | 56 | D | | | | | | | |
| | 100% return Air+Mist (Brown) | 97 | 73 | 65 | | | | | | . . . at 47.20m very small flint up to 40mm. | 84[i] | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | R620 |

| Contract Ref: | Start: 25.04.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 30.04.18 | 79.62 | E:412752.2 N:141959.2 | 25 of 47 |

| Depth | Flush Returns & Details | Mechanical Log TCR (%) | SCR (%) | RQD (%) | If (mm) | Samples No | Type | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 48.00-48.30 | 100% return Air+Mist (Brown) | 97 | 73 | 65 | 200 600 | 57 | U | | | Weak high to very high density white slightly nodular CHALK with occasional thick and wispy marl. Fracture set 1: Fractures are 15-25° closely to widely spaced undulating rough partly open clean with occasional comminuted chalk infill (180/300/1640). Fracture set 2: Fractures are 45-60° widely spaced undulating rough to striated partly open to open with brown stained surfaces with slickensides and rare black specks. (Grade C3) *(stratum copied from 45.20m from* previous sheet) . . . between 47.82m and 48.00m thick marl up to 5mm. . . . at 47.90m and 48.00m nodular rinded flint up to 20mm. | 85[i] | 31.32 | 48.30 | |
| | | | | | | | | | | Borehole terminated at 48.30m depth. | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: 1:11

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary Cored | Comacchio MC450-P1 | Lee Harris | IFoster + BSaimen | |

**Appendix 6: R71907 Borehole Log**

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **1** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Very soft light brown slightly sandy slightly gravelly SILT. Sand is fine to medium. Gravel is angular to subangular fine to coarse flint. (TOPSOIL) | | 98.05 | (0.30) 0.30 | |
| 1.20-2.30 (0:01) | | | | 73 | 5 | 0 | NI 100 190 | | | | Structureless CHALK composed of brownish cream slightly gravelly sandy SILT. Gravel is subrounded to rounded medium density white chalk with occasional angular to subangular fine flint. (SEAFORD CHALK Grade Dm) | | 97.15 | (0.90) 1.20 | |
| | | | | | | | | | | | Very weak low density white with light black specks CHALK. Fracture set 1: 10-20° closely spaced (80/100/350) planar smooth open with light brown staining on surfaces. Fracture set 2: 60-75° very closely to closely (50/100/150) spaced undulating planar open with light brown staining and black | | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 15/08/18 | 08:30 | 3.80 | 3.50 | 146 | Dry |
| 15/08/18 | 16:45 | 39.80 | 33.40 | 146 | 32.40 |
| 16/08/18 | 08:30 | 39.80 | 32.50 | 146 | 31.75 |
| 16/08/18 | 16:30 | 45.80 | 45.40 | 146 | 32.40 |
| 20/08/18 | 08:30 | 45.80 | 45.20 | 146 | 31.20 |
| 20/08/18 | 16:45 | 51.80 | 51.20 | 146 | 30.80 |
| 21/08/18 | 13:30 | 51.80 | 51.20 | 146 | 31.80 |
| 21/08/18 | 17:00 | 67.80 | 67.20 | 146 | 31.50 |

## General Remarks

1. Location CAT scanned prior to excavation.
2. First strata encountered excavated by Archaeologists.
3. Hand dug inspection pit to 1.20m depth on 14/08/2018.
4. No groundwater strikes noted by the driller.
5. Borehole drilled using a 146mm geobore S core barrel and air mist as the flush medium.
6. 50mm PVC groundwater monitoring pipe installed as shown.

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **2** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.30-3.80 (0:01) | | | | 73 | 5 | 0 | NI 100 190 | 90% return Air+Mist (White) | | | specks on fracture surfaces. (SEAFORD CHALK Grade B3) . . . at 1.20m gravel sized flint up to 40mm. | 1 2 3 4 5 | | (1.40) | |
| | | | | | | | | | | | . . . between 2.20m to 2.30m recovered non intact. | | | | |
| | | | | | | | | | | | . . . at 2.40m gravel sized flint up to 20mm. | 6 | 95.75 | 2.60 | |
| | | | | 100 | 23 | 0 | NI 180 280 | 90% return Air+Mist (White) | | | Very weak low density white with light black specks CHALK. Fracture set 1: 5-15° closely to very widely spaced(150/300/1500) planar smooth clean with light brown staining on surfaces. Fracture set 2: 20-45° (20/70/1340) extremely to widely spaced undulating closed clean with light black specks on surfaces. Fracture set 3: 55-70° closely to widely spaced (30/160/2000) undulating open clean with black specs on fracture surfaces. (SEAFORD CHALK Grade A3) | 7 8 9 10 11 12 13 14 15 16 17 18 | | | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **3** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.80-5.30 (0:01) | | | | 100 | 23 | 0 | | | | | . . . between 3.8m and 6.8m core predominantly recovered non intact. | 19[i] | | | |
| | | | | 80 | 9 | 0 | NI 180 280 | 30% return Air+Mist (White) | | | . . . at 4.42m fine to coarse gravel sized flint up to 10mm. | 20 | | | |
| | | | | | | | | | | | . . . at 4.70m gravel sized flint nodule up to 40mm. | 21 | | | |
| | | | | | | | | | | | | 22 | | | |
| | | | | | | | | | | | | 23 | | | |
| | | | | | | | | | | | | 24[i] | | | |
| | | | | | | | | | | | | 25[i] | | | |
| | | | | | | | | | | | | 26[i] | | | |
| 5.30-6.80 (0:02) | | | | 53 | 11 | 0 | | | | | | 27[i] | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: **15.08.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **4** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.80-8.30 (0:01) | | | | 53 | 11 | 0 | NI 180 280 | 20% return Air+Mist (White) | | | . . . at 6.70m full diameter micraster up to 20mm. | 28 29 30 31 | | (7.30) | |
| | | | | 87 | 38 | 23 | | 20% return Air+Mist (White) | | | | 32 | | | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **5** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8.30-9.80 (0:01) | | | | 87 | 38 | 23 | NI 180 280 | 20% return Air+Mist (White) | | | . . . at 7.50m, 7.70m and 7.80m brown stained sponges to 35mm.<br>. . . at 7.93m marl seam up to 3mm.<br>. . . at 8.04m tubular flint up to 10mm.<br>. . . at 8.70m flint nodule up to 30mm.<br>. . . between 9.20m and 9.32m recovered non intact. | 33<br>34[i]<br>35<br>36<br>37<br>38<br>39[i] | | | |
| | | | | 87 | 41 | 25 | | 20% return Air+Mist (White) | | | | | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | [redacted] |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **6** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9.80-11.30 (0:03) | | | | 87 | 41 | 25 | NI 180 280 | 10% return Air+Mist (White) | | | Extremely weak to very weak low density off white CHALK with occasional brown stained sponges to 10mm diameter. Fractures are 0-15° extemely closely to medium spaced (80/200/370) undulating rough open infilled with fine to medium gravel sized chalk fragments. (SEAFORD CHALK Grade A2) | 40[i] 41[i] | 88.45 | 9.90 | |
| | | | | 67 | 13 | 0 | NI 200 370 | | | | . . . between 10.40m to 10.47m recovered non intact. . . . between 10.53m to 10.58m brown stained sponges to 25mm. . . . at 10.70m fragmented core potentialy contains greenish glauconite up to 50mm. . . . from 10.7m to 11.3m subvertical stepped rough tight to open fracture with fine to medium gravel sized chalk infill and black specs on fracture surfaces. . . . between 10.80m to 10.87m occasional brown stained sponges to 35mm within weakened chalk. . . . between 11.20m and 11.30m recovered non intact. | 42 43 | | | |
| 11.30-12.80 (0:01) | | | | 73 | 37 | 32 | | | | | | | | (3.10) | |

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_018 PrjVersion: v8_06 - Core+Full Bristol SI - 012 | Log XCUSTOM - 562689 - COMPOSITE LOG - A4P | 733442_A3003_STONEHENGE_PHASE_6_GROUND_INVESTIGATION.GPJ - v8_06.
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk. | 11/04/19 - 16:38 | KJ2 |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **7** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12.80-14.30 (0:01) | | | | 73 | 37 | 32 | NI 200 370 | 10% return Air+Mist (White) | | | . . . at 12.1m two 20° fractures extend across the core roughly 70 degrees apart. Fractures are undulose stepped smooth and tight with black specs on fracture surfaces. | 44 45 46 47 | | | |
| | | | | 87 | 40 | 30 | NI 80 180 | 10% return Air+Mist (White) | | | Very weak to extremely weak low density white with occasional black specs CHALK with occasional thin grey marl up to 3mm and rare *Platyceramus* fossils. Fracture set 1: 5-20° medium spaced (210/250/420) undulose rough to planar smooth open infilled with up to 2mm of communited chalk. Fracture set 2: 40-45° medium spaced (200/350/520) undulose rough occasionally stepped tight and clean to open infilled with coarse sand to fine gravel size chalk | 48[i] | 85.35 | 13.00 | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | [redacted] |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: **15.08.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **8** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14.30-15.80 (0:02) | | | | 87<br>100 | 40<br>32 | 30<br>19 | NI 80 180 | 10% return Air+Mist (White)<br>10% return Air+Mist (White) | | | fragments up to 1mm. (SEAFORD CHALK Grade B3)<br>. . . at 13.33m rare *Platyceramus* fossils.<br>. . . at 13.50m grey marl up to 2mm.<br>. . . at 13.60m and 13.72m rare brown stained sponges to 25mm.<br>. . . at 13.70m marl up to 2mm.<br>. . . at 13.85m marl up to 2mm.<br>. . . at 13.88m marl up to 2mm.<br>. . . at 14.00m rinded flint nodule up to 20mm.<br>. . . at 14.55m wispy marl. | 49[i]<br>50[i]<br>51<br>52<br>53<br>54<br>55[i]<br>56[i]<br>57 | | (2.80) | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | [redacted] |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **9** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15.80-17.30 (0:01) | | | | 100 | 32 | 19 | NI 80 180 | | | | Extremely weak to very weak low density off white CHALK with rare wispy marl and brown stained sponges to 15mm diameter. Fractures are 20-65° close to medium (120/180/210) spaced planar smooth tight with brown staining and up to 3mm of communited chalk on surfaces. (SEAFORD CHALK Grade B3) | 58[i] | 82.55 | 15.80 | |
| | | | | 100 | 40 | 20 | NI 180 210 | 5% return Air+Mist (White) | | | | 59 60 61 62 63 | | (1.50) | |
| 17.30-18.80 (0:01) | | | | 43 | 23 | 23 | | | | | Assessed Zone of Core Loss | | 81.05 | 17.30 | AZCL |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: **15.08.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **10** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | (0.90) | AZCL |
| | | | | 43 | 23 | 23 | | 0% return Air+Mist (No returns) | | | | | 80.15 | 18.20 | |
| | | | | | | | NI 100 130 | | | | Extremely weak to very weak low density off white CHALK with rare wispy marl and brown stained sponges to 15mm diameter. Fractures are 20- 25° closely spaced (90/100/130) stepped rough open infilled with up to 1mm of granular chalk, with brown staining on surfaces. (SEAFORD CHALK Grade B3) . . . at 18.50m nodular flint up to 30mm. | | | (0.60) | |
| 18.80-20.30 (0:01) | | | | 100 | 49 | 46 | NI 250 280 | 0% return Air+Mist (No returns) | | | Extremely weak to very weak low density white CHALK with possible *Volviceramus* and *Platyceramus* fossils. Fracture set 1: 5-20° closely to very widely spaced (190/1100/2930) undulating rough open infilled with up to 2mm communited chalk or clean. Fracture set 2: 25-45° closely to very widely spaced (160/700/1730) undulating partly open infilled with up to 1mm white communited chalk with light black specks and brown staining on fracture surfaces. Fracture set 3: 50-85° closely to very widely (70/390/1500) spaced undulating planar tight to partially open with light black specks and brown staining on fracture surfaces. (SEAFORD CHALK Grade B3) | 64 65[i] | 79.55 | 18.80 | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: **15.08.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **11** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20.30-21.80 (0:01) | | | | 100 | 49 | 46 | NI 250 280 | 0% return Air+Mist (No returns) | | | . . . at 18.80m 100mm flint across whole core diameter. . . . at 19.20m possible *Volviceramus* (thick shells). . . . at 19.60m possible *Platyceramus* (thin shell). | 66[i] 67 68 69 | | | |
| | | | | 93 | 48 | 37 | | 0% return Air+Mist (No returns) | | | . . . between 21.10m and 21.20m chalk crumbles when handled. | 70 71[i] | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **12** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21.80-23.30 (0:01) | | | | 93 | 48 | 37 | | | | | . . . at 21.50m brown stained sponges to 25mm. | 72 | | | |
| | | | | | | | | | | | | 73[i] | | | |
| | | | | | | | | | | | | 74[i] | | | |
| | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | 75 | | | |
| | | | | | | | | | | | | 76 | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | 77 | | | |
| | | | | 100 | 60 | 35 | NI 250 280 | 0% return Air+Mist (No returns) | | | . . . at 22.50m group of wispy marl up to 1mm. . . . at 22.55m rounded brown sponges to 45mm. | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | 78 | | | |
| | | | | | | | | | | | . . . at 22.73m group of wispy marl up to 1mm. | | | | |
| | | | | | | | | | | | . . . at 22.82m possible *Platyceramus* (thin shell). | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | . . . at 23.00m nodular flint up to 60mm. | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | 79 | | | |
| | | | | | | | | | | | | | | (9.00) | |
| 23.30-24.80 (0:01) | | | | 87 | 53 | 35 | | | | | | | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **13** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24.80-26.30 (0:01) | | | | 87<br>93 | 53<br>40 | 35<br>31 | NI 250 280 | 0% return Air+Mist (No returns)<br>0% return Air+Mist (No returns) | | | . . . at 23.90m micraster.<br>. . . between 24.37m and 24.47m flint up to 60mm. | 80<br>81<br>82[i]<br>83[i]<br>84<br>85<br>86 | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: **15.08.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **14** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26.30-27.80 (0:01) | | | | 93 | 40 | 31 | NI 250 280 | 0% return Air+Mist (No returns) | | | . . . at 25.86m flint up to 30mm. | 87 88[i] 89 90[i] 91 | | | |
| | | | | 93 | 37 | 27 | | 0% return Air+Mist (No returns) | | | . . . at 26.30m fine to coarse gravel sized fragments of flint. . . . between 26.35m and 26.40m recovered non intact as fragments of high density chalk. . . . at 26.70m recovered non intact. . . . between 26.80m and 27.04m chalk crumbles when handled. . . . at 26.97m fragments of flint embedded in comminuted chalk. . . . at 37.13m 25mm rounded brown stained sponge. | 92 93 | | | |

*Description on next sheet*

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | [redacted] |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: **15.08.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **15** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 93 | 37 | 27 | NI 250 280 | | | | . . . at 27.45m two 45° fractures roughly 90° apart bisect core. . . . at 27.50m grey marl up to 20mm. | 94 | 70.55 | 27.80 | |
| 27.80-29.30 (0:01) | | | | 97 | 47 | 35 | NI 180 380 | 0% return Air+Mist (No returns) | | | Very weak low density white CHALK with rare brown stained sponges to 20mm diameter. Fracture set 1: 5° medium to widely spaced (330/600/1000) undulating to planar partially open to open infilled with up to 1.5mm comminuted and granular chalk or clean. Fracture set 2: 20-45° medium spaced (350/1000.2430) undulating smooth to rough partially open to open with granular chalk infill and black specks on fracture surfaces. Fracture set 3: are 50-85° extremely closely to widely spaced (50/220/2430) planar smooth tight and clean. (SEAFORD CHALK Grade B3) . . . at 27.80m 45° fracture with striations and balck specs on fracture surface. . . . at 28.03m 5mm phosphatic nodule. . . . at 28.10m occasional brown stained specks. . . . between 28.52m and 28.58m flint up to 60mm. | 95[i] 96 97 | | | |
| 29.30-30.80 (0:01) | | | | 100 | 55 | 49 | | | | | . . . at 29.20m shell fragments of micraster. | | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **16** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30.80-32.30 (0:01) | | | | 100 | 55 | 49 | NI 180 380 | 0% return Air+Mist (No returns) | | | | 98 | | (4.85) | |
| | | | | 100 | 65 | 61 | | 0% return Air+Mist (No returns) | | | . . . at 31.35m wispy marl. | 99 | | | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **17** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32.30-33.80 (0:01) | | | | 100 | 65 | 61 | NI 180 380 | 0% return Air+Mist (No returns) | | | . . . at 31.61m nodules of rinded flint up to 30mm embedded in comminuted chalk.<br>. . . at 31.70m possible echnoids/micraster shells. | 100<br>101 | | | |
| | | | | | | | | | | | . . . between 32.46m and 32.60m frequent brown stained sponges to 55mm. | 102[i] | 65.70 | 32.65 | |
| | | | | 100 | 61 | 55 | NI 100 150 | 0% return Air+Mist (No returns) | | | Weak high density white CHALK with occasional brown stained sponges to 20mm diameter. Fractures are 5-15° closely spaced (70/100/150 undulating clean partially open to wide open infilled with up to 1.5mm white communited chalk and fine gravel size chalk fragments. (SEAFORD CHALK Grade B2)<br>. . . between 32.75m and 32.83m brown sponges to 45mm.<br>. . . 40mm fragmented sheet flint within 45 degree fracture | 103[i]<br>104[i] | 65.15 | (0.55)<br>33.20 | |
| | | | | | | | NI 170 270 | | | | Very weak medium density white CHALK. Fracture set 1: 5° very widely spaced (1380/1380/1380) undulating rough open infilled with up to 2mm communited chalk or clean, with black specks on fracture surfaces. Fracture set 2: 20-85° close to medium spaced (170/420/860) | 105 | | | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **18** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33.80-35.30 (0:01) | | | | 100 | 61 | 55 | | | | | undulose rough partially open to open infilled with communited chalk with black specs on fracture surfaces. (SEAFORD CHALK Grade B2) | 106 | | | |
| | | | | | | | | | | | . . . from 33.70m to 33.90m subvertical planar smooth tight fracture extends between adjacent subhorizontal fractures and terminates on a subhorizontal fracture. | 107 | | | |
| | | | | | | | | | | | | 108 | | | |
| | | | | | | | | | | | | 109 | | | |
| | | | | | | | | | | | . . . from 34.25m to 34.30m flint nodules up to 15mm embedded within comminuted chalk. | | | | |
| | | | | 100 | 45 | 33 | NI 170 270 | 0% return Air+Mist (No returns) | | | | 110[i] | | | |
| | | | | | | | | | | | | 111[i] | | | |
| | | | | | | | | | | | | 112[i] | | | |
| | | | | | | | | | | | | 113[i] | | (3.85) | |
| 35.30-36.80 (0:01) | | | | 100 | 80 | 80 | | | | | | | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **19** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36.80-38.30 (0:01) | | | | 100 | 80 | 80 | NI 170 270 | 0% return Air+Mist (No returns) | | | . . . at 36.50m brown fish scales. | 114[i] 115[i] | | | |
| | | | | 100 | 23 | 0 | NI 50 100 | 0% return Air+Mist (No returns) | | | Very weak locally extremely weak low density white CHALK. Fractures 5-70° close to medium spaced (80/170/270) undulating rough partly open with light black specks on fracture surfaces. Strata is notably friable and crumbles into fine to coarse gravel sized fragments when handled. (SEAFORD CHALK Grade B2) | 116 117 118[i] 119[i] | 61.30 | 37.05 | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: **15.08.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **20** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | . . . at 37.60m brown stained sponges to 35mm. | 120 | | (1.25) | |
| | | | | 100 | 23 | 0 | NI 50 100 | 0% return Air+Mist (No returns) | | | . . . between 37.80m and 38.00m brown stained sponges to 15mm. . . . between 37.93m and 38.02m recovered non intact. | 121[i] | | | |
| | | | | | | | | | | | | 122 | | | |
| 38.30-39.80 (0:01) | | | | | | | | | | | | | 60.05 | 38.30 | |
| | | | | 100 | 69 | 49 | NI 200 280 | 0% return Air+Mist (No returns) | | | Very weak medium density white slightly brown stained CHALK with occasional marl and brown stained sponges to 30mm diameter. Fractures are 5-45° very closely to medium spaced (30/200/280) planar rough to smooth tight and clean with light brown specs on surfaces. (BELLE TOUT BEDS Grade C2) . . . from 38.7m to 39.05m 45-50° undulating smooth open fracture partialy infilled with fine gravel size chalk fragments. . . . at 38.85m occasional brown stained sponges to 55mm. . . . at 39.10m nodular flint up to 20mm. . . . at 39.20m possible shell of echnoids. . . . at 39.30m occasional brown stained sponges to 45mm. *Description on next sheet* | 123[i] | | | |
| | | | | | | | | | | | | 124[i] | | | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **21** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 100 | 69 | 49 | | | | | . . . at 39.45m rounded brown sponges to 35mm. | | | | |
| 39.80-41.30 (0:01) | | | | | | | | | | | | | | (3.00) | |
| | | | | | | | NI 200 280 | 0% return Air+Mist (No returns) | | | . . . at 40.18m sheet flint up to 10mm. | 125[i] | | | |
| | | | | | | | | | | | | 126 | | | |
| | | | | | | | | | | | . . . between 40.40m and 40.55m chalk crumbles into angualr fragemts when handled. | 127[i] | | | |
| | | | | 93 | 65 | 49 | | | | | . . . at 40.50m marl seam up to 3mm. | | | | |
| | | | | | | | | | | | | 128 | | | |
| | | | | | | | | | | | | 129 | | | |
| | | | | | | | | | | | . . . at 40.75m occasional brown stained sponges to 35mm. | | | | |
| | | | | | | | | | | | . . . at 40.85m marl up to 5mm with some wispy marls. | 130 | | | |
| | | | | | | | | | | | | 131 | | | |
| | | | | | | | | | | | | 132[i] | | | |
| | | | | | | | | | | | | | 57.05 | 41.30 | |
| 41.30-42.80 (0:01) | | | | 97 | 67 | 40 | NI 210 420 | | | | Very weak locally extremely weak low to medium density white CHALK with occasional marl up to 5mm. Fracture set 1: 5-20° medium to widely spaced (320/880/2430) planar | | | | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **22** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | smooth to stepped smooth and tight. Fracture set 2: 20-65° close to widely spaced (80/440/720) smooth planar tight with light brown staining on fracture surfaces. (BELLE TOUT BEDS Grade A3) | 133<br>134 | | | |
| | | | | 97 | 67 | 40 | NI 210 420 | 0% return Air+Mist (No returns) | | | . . . at 42.20m cobbles of subangular flint | 135[i] | | | |
| 42.80-44.30 (0:01) | | | | 83 | 80 | 60 | | 0% return Air+Mist (No returns) | | | . . . between 42.60m and 42.65m rinded flint up to 60mm. | 136<br>137 | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **23** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 44.30-45.80 (0:01) | | | | 83 | 80 | 60 | NI 210 420 | 0% return Air+Mist (No returns) | | | . . . between 43.80m and 43.90m rinded flint up to 60mm. | 138 | | | |
| | | | | 90 | 70 | 65 | | 0% return Air+Mist (No returns) | | | | 139 | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **24** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45.80-47.30 (0:01) | | | | 90 | 70 | 65 | | | | | . . . between 45.80m and 46.10m recovered non intact. | | | (8.95) | |
| | | | | 100 | 57 | 50 | NI 210 420 | 0% return Air+Mist (No returns) | | | | 140<br>141<br>142[i] | | | |
| 47.30-48.80 (0:02) | | | | 100 | 67 | 63 | | | | | . . . from 47.15m to 47.50m 45° undulose smooth tight clean fracture. | 143<br>144 | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **25** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 48.80-50.30 (0:01) | | | | 100 | 67 | 63 | NI 210 420 | 0% return Air+Mist (No returns) | | | . . . at 47.76m possible *Platyceramus*.<br>. . . at 47.84m nodular flint up to 30mm.<br>. . . at 47.98m marl up to 3mm.<br>. . . at 48.12m wispy marl up to 1mm.<br>. . . at 48.34m nodular flint recovered fragmented.<br>. . . at 49.04m nodular flint up to 30mm.<br>. . . at 49.30m nodular flint up to 20mm. | 145[i]<br>146<br>147<br>148 | | | |
| | | | | 100 | 90 | 90 | | 0% return Air+Mist (No returns) | | | | | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: **15.08.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **26** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | . . . at 49.50m occasional brown sponges to 45mm. | | | | |
| | | | | | | | | | | | . . . at 49.70m occasional brown sponges to 35mm. | | | | |
| | | | | 100 | 90 | 90 | NI 210 420 | 0% return Air+Mist (No returns) | | | | 149 | 48.10 | 50.25 | |
| 50.30-51.80 (0:01) | | | | | | | | | | | Weak high density white CHALK with rare *Platyceramus*, grey marl up to 2mm, occasional angular flint fragments and wispy marl seams. Fracture set 1: 5-10° close to widely spaced (100/540/1540) undulating rough open infilled with up to 5mm communited chalk. Fracture set 2: 25-65° medium to widely spaced (300/12400/2450) undulose smooth occasionally slightly polished with black specks on fracture surfaces. (BELLE TOUT BEDS Grade B2) | 150 | | | |
| | | | | | | | | | | | . . . between 50.50m and 50.65m chalk is locally very weak and contains occasional brown stained sponges to 35mm. | 151 | | | |
| | | | | | | | | | | | . . . at 50.88m grey marl up to 3mm. | | | | |
| | | | | | | | | | | | . . . at 50.92m grey marl up to 5mm. | | | | |
| | | | | | | | | | | | . . . at 50.95m grey marl up to 3mm. | | | | |
| | | | | 93 | 70 | 67 | NI 220 500 | 0% return Air+Mist (No returns) | | | | | | | |
| | | | | | | | | | | | . . . at 51.25m nodular flint up to 10mm. | | | | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **27** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51.80-53.30 (0:01) | | | | 93 | 70 | 67 | | | | | . . . at 51.52m possible *Volviceramus*.. . . . at 51.55m grey marl up to 5mm. . . . at 51.65m phosphatic nodules up to 6mm. . . . at 51.82m grey marl up to 2mm. . . . at 51.95m grey marl up to 4mm. . . . at 52.00m nodular flint up to 10mm. . . . at 52.10m possible *Platyceramus*. . . . at 52.20m nodular flint up to 10mm. | 152 | | | |
| | | | | 97 | 87 | 80 | NI 220 500 | 0% return Air+Mist (No returns) | | | . . . at 52.40m grey marl up to 1mm. . . . at 52.70m possible *Platyceramus*. . . . at 52.90m nodular flint up to 20mm. . . . at 53.15m nodular flint up to 10mm. . . . at 53.25m nodular flint up to 10mm. . . . at 53.35m *Platyceramus*. | 153[i] | | | |
| 53.30-54.80 (0:02) | | | | 87 | 67 | 63 | | | | | | 154 | | | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **28** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 54.80-56.30 (0:02) | | | | 87 | 67 | 63 | NI 220 500 | 0% return Air+Mist (No returns) | | | . . . at 53.72m *Platyceramus*.<br>. . . at 53.85m rinded flint up to 30mm.<br>. . . at 54.13m grey marl up to 10mm.<br>. . . at 54.75m grey marl with wispy marl up to 5mm.<br>. . . at 54.85m rounded sponges to 35mm.<br>. . . at 55.20m brown stained sponges (corrugated type) to 65mm.<br>*Description on next sheet* | 155<br>156[i]<br>157[i]<br>158<br>159<br>160<br>161[i] | | (7.75) | |
| | | | | 100 | 70 | 67 | | 0% return Air+Mist (No returns) | | | | | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **29** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 56.30-57.80 (0:02) | | | | 100 | 70 | 67 | NI 220 500 | 0% return Air+Mist (No returns) | | | . . . at 55.45m grey marl up to 5mm with wispy marl. . . . between 55.55m and 55.62m rinded flint recovered as angular fine to coarse gravel of flint. | 162[i] 163[i] | | | |
| | | | | | | | | | | | . . . at 55.96m wispy marl up to 1mm. | 164[i] | | | |
| | | | | | | | | | | | . . . at 56.20m occasional wispy marl. | | | | |
| | | | | 94 | 67 | 57 | | 0% return Air+Mist (No returns) | | | . . . at 56.50m rounded sponges to 45mm. . . . between 56.55m and 56.65m flint up to 90mm. | 165[i] | | | |
| | | | | | | | | | | | . . . at 56.95m nodular flint up to 20mm. | 166[i] | | | |
| | | | | | | | | | | | . . . between 57.30m and 57.40m occasional brown stained sponges to 35mm. . . . at 57.40m grey marl up to 5mm. *Description on next sheet* | 167 | | | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **30** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | . . . at 57.45m group of wispy marl up to 1mm. | | | | |
| | | | | 94 | 67 | 57 | | | | | . . . at 57.63m nodular flint up to 20mm. | | | | |
| | | | | | | | NI 220 500 | | | | | | | | |
| 57.80-59.30 (0:01) | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 40.35 | 58.00 | |
| | | | | | | | | | | | Weak high density greyish white and white CHALK with occasional thick grey marl and *Platyceramus* fossils. Fracture set 1: 5-10° close to widely spaced (70/580/950) undulose rough tight to partially open and clean. Fracture set 2: 30-65° very closely to widely spaced (90/850/1550) tight to open clean to infilled with up to 2.5mm communited chalk. (BELLE TOUT BEDS Grade B2) | 168 | | | |
| | | | | | | | | | | | . . . at 58.00m fine to coarse fragmented flint (possible flint band up to 30mm). | | | | |
| | | | | 93 | 83 | 74 | | 0% return Air+Mist (No returns) | | | . . . at 58.37m to 58.48m wispy marl up to 10mm. | | | | |
| | | | | | | | NI 300 610 | | | | . . . at 58.70m possible *Volviceramus*. | | | | |
| | | | | | | | | | | | . . . at 58.80m nodular flint up to 20mm. | 169 | | | |
| | | | | | | | | | | | | 170[i] | | | |
| 59.30-60.80 (0:03) | | | | | | | | | | | . . . at 59.25m rinded nodular flint up to 25mm. | | | | |
| | | | | 90 | 60 | 47 | | | | | . . . between 59.40m and 59.75m recovered non intact. *Description on next sheet* | | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **31** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60.80-62.30 (0:02) | | | | 90 | 60 | 47 | NI 300 610 | 0% return Air+Mist (No returns) | | | . . . at 59.45m rinded flint up to 40mm.<br>. . . between 59.70m and 59.75m flint up to 80mm.<br>. . . at 60.20m rinded flint up to 30mm.<br>. . . at 60.38m occasional *Volviceramus* fossils.<br>. . . at 60.80m occasional wispy marl and trace fossils.<br>. . . at 60.96m rinded nodular flint up to 30mm.<br>. . . at 61.30m sheet flint up to 25mm.<br>. . . at 61.32m grey marl up to 6mm.<br>. . . at 61.43m sheet flint.<br>*Description on next sheet* | 171<br>172[i]<br>173[i]<br>174 | | (5.80) | |
| | | | | 100 | 88 | 77 | | 0% return Air+Mist (No returns) | | | | | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | [redacted] |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: **15.08.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **32** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 62.30-63.80 (0:15) | | | | 100 | 88 | 77 | NI 300 610 | 0% return Air+Mist (No returns) | | | . . . at 61.46m grey marl up to 5mm.<br>. . . at 61.80m flint nodules up to 10mm and occasional wispy marl.<br>. . . at 62.23m grey marl up to 20mm.<br>. . . at 62.85m nodular flint up to 10mm.<br>. . . at 62.97m rinded nodular flint up to 20mm.<br>. . . between 63.15m and 63.25m grey marl up to 3mm with wispy marl. | 175<br>176<br>177<br>178<br>179[i] | | | |
| | | | | 80 | 38 | 8 | | 0% return Air+Mist (No returns) | | | | | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **33** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instrumentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 63.80-65.30 (0:05) | | | | 80 | 38 | 8 | NI 300 610 | 0% return Air+Mist (No returns) | | | Weak high density white CHALK with occasional thick and wispy marl up to 10mm, angular flint fragments and *Platyceramus* fossils. Fractures are predominantly 5-10° closely spaced (80/150/240) undulating rough tight and clean. (BELLE TOUT BEDS Grade B3)<br>. . . at 63.94m marl up to 10mm.<br>. . . at 63.97m grey marl up to 7mm.<br>. . . at 64.07m grey marl up to 3mm.<br>. . . at 64.30m fine to medium fragments of rinded flint up to 3mm. | 180[i]<br>181<br>182<br>183[i]<br>184<br>185[i]<br>186<br>187 | 34.55 | 63.80 | |
| | | | | 100 | 77 | 63 | NI 150 240 | | | | . . . between 64.80m and 64.86m sheet flint.<br>. . . at 64.92m *Platyceramus*.<br>. . . at 65.20m rinded flint up to 60mm. | | | | |
| 65.30-66.80 (0:04) | | | | 100 | 83 | 79 | | | | | . . . at 65.42m possible *Platyceramus*. | 188 | | (3.00) | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 7 Ground Investigation** | **Highways England** | **R71907** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **15.08.18** End: **21.08.18** | **98.35** | **E:412939.1 N:141968.9** | **34** of **64** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Backfill & Instru-mentation | Water | Description of Strata | Fracture Log | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 100 | 83 | 79 | NI 150 240 | 0% return Air+Mist (No returns) | | | . . . at 65.70m nodular flints up to 15mm.<br>. . . at 65.83m grey marl up to 5mm.<br>. . . between 66.00m and 66.50m rinded flint up to 50mm.<br>. . . at 66.17m nodular flint up to 25mm.<br>. . . at 66.20m grey marl up to 5mm.<br>. . . at 66.34m grey marl with wispy marl up to 5mm.<br>. . . at 66.45m wispy marl up to 1mm.<br>. . . between 66.64m and 66.80m occasional trace fossils. | 189<br>190 | | | |
| | | | | | | | | | | | Borehole terminated at 66.80m depth. | | 31.55 | 66.80 | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:11**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary Cored** | **Comacchio MC450-P1** | **Dean Walker** | **PRadcliffe + BSaimen** | |

**Appendix 7: RX621 Borehole Log**

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX621** |

| Contract Ref: | Start: **24.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **02.05.18** | **79.99** | **E:412751.3 N:141919.2** | **1** of **9** |

| Drilling Progress Log | | Flush Returns & Details | Samples | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | | | | | | |
| 0.50 | 1.20 - 3.00 (00:01) | 100% return Air+Mist (White) | 101 | ES | | | Brown slightly gravelly sandy SILT with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of chalk and flint. Cobbles are subrounded flint. | 79.69 | 0.30 | |
| | | | | | | | Cream and pale brown structureless CHALK comprising slightly sandy gravelly SILT with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of chalk and rare flint. Cobbles are subangular to subrounded chalk and rare flint. (Grade Dm) | 79.29 | 0.70 | |
| | | | | | | | White and cream structureless CHALK comprising slightly sandy silty angular to subrounded fine to coarse GRAVEL of chalk and rare flint. Sand is fine to coarse. (Grade Dc) | | (0.50) | |
| | | | | | | | CHALK with flints (driller's description). | 78.79 | 1.20 | |
| | 3.00 - 6.00 (00:01) | 100% return Air+Mist (White) | | | | 1 | | | | |
| | 6.00 - 9.00 (00:01) | 100% return Air+Mist (White) | | | | 1 | . . . at 6.00m depth excess water (driller's description). | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 24/04/18 | 13:00 | 6.00 | 1.60 | 146 | 6.00 |
| 24/04/18 | 14:20 | 48.00 | 4.00 | 146 | 5.50 |
| 30/04/18 | 16:30 | 48.00 | 4.00 | 146 | 5.40 |
| 01/05/18 | 08:30 | 6.70 | 4.00 | 146 | 5.20 |
| 01/05/18 | 09:00 | 6.70 | 2.60 | 200 | - |
| 01/05/18 | 17:00 | 48.00 | 42.00 | 146 | 19.40 |
| 02/05/18 | 08:30 | 48.00 | 42.00 | 146 | 5.30 |
| 02/05/18 | 15:50 | 46.00 | None | 146 | 5.40 |

## General Remarks

1. Location CAT scanned prior to excavation.
2. First strata encountered excavated by Archaeologists.
3. Hand dug inspection pit to 1.20m depth on 26/03/2018.
4. Groundwater strike at 6.00m depth, rising to 5.50m depth after 20 minutes.
5. Borehole drilled initially using 146mm open hole rotary bit and air mist as the flush medium, Geobore S casing installed due to collapse at 6.70m.
6. 50mm PVC groundwater monitoring pipe installed as shown.

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary open hole** | **Comacchio MC450-P1** | **Lee Harris** | **IFoster** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX621** |

| Contract Ref: | Start: **24.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **02.05.18** | **79.99** | **E:412751.3 N:141919.2** | **2** of **9** |

| Drilling Progress Log | | Flush Returns & Details | Samples | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | | | | | | |
| | 6.00 - 9.00 (00:01) | | | | | | CHALK with flints (driller's description).<br>*(stratum copied from 1.20m from previous sheet)*<br><br>. . . at 9.00m to 9.50m depth flint band (driller's description). | | | |
| | 9.00 - 12.00 (00:01) | 100% return Air+Mist (Brown) | | | | | | | | |
| | 12.00 - 15.00 (00:01) | 100% return Air+Mist (Brown) | | | | | | | | |
| | 15.00 - 18.00 (00:01) | 100% return Air+Mist (Brown) | | | | | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary open hole** | **Comacchio MC450-P1** | **Lee Harris** | **IFoster** | |

# STRUCTURAL SOILS

**DRAFT**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX621** |

| Contract Ref: | Start: **24.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **02.05.18** | **79.99** | **E:412751.3 N:141919.2** | **3** of **9** |

| Drilling Progress Log | | Flush Returns & Details | Samples | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | | | | | | |
| | 18.00 - 21.00 (00:01) | 100% return Air+Mist (Brown) | | | | | CHALK with flints (driller's description).<br>*(stratum copied from 1.20m from previous sheet)* | | (40.80) | |
| | 21.00 - 24.00 (00:01) | 100% return Air+Mist (Brown) | | | | | | | | |
| | 24.00 - 27.00 (00:01) | 100% return Air+Mist (White) | | | | | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary open hole** | **Comacchio MC450-P1** | **Lee Harris** | **IFoster** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX621** |

| Contract Ref: | Start: **24.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **02.05.18** | **79.99** | **E:412751.3 N:141919.2** | **4** of **9** |

| Drilling Progress Log | | Flush Returns & Details | Samples | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | | | | | | |
| | 27.00 - 30.00 (00:01) | 100% return Air+Mist (White) | | | | | CHALK with flints (driller's description). *(stratum copied from 1.20m from previous sheet)* | | | |
| | 30.00 - 33.00 (00:01) | 100% return Air+Mist (White) | | | | | | | | |
| | 33.00 - 36.00 (00:02) | 100% return Air+Mist (Brown) | | | | | . . . at 34.00m to 34.70m depth flint band (driller's description). | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary open hole** | **Comacchio MC450-P1** | **Lee Harris** | **IFoster** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX621** |

| Contract Ref: | Start: **24.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **02.05.18** | **79.99** | **E:412751.3 N:141919.2** | **5** of **9** |

| Drilling Progress Log | | Flush Returns & Details | Samples | | Backfill & Instru-mentation | Water | Description of Strata | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | | | | | | |
| | 36.00 - 39.00 (00:02) | 100% return Air+Mist (Brown) | | | | | CHALK with flints (driller's description). *(stratum copied from 1.20m from previous sheet)* | | | |
| | 39.00 - 42.00 (00:01) | 100% return Air+Mist (Brown) | | | | | . . . at 39.10m to 39.60m depth flint band (driller's description). | | | |
| | | | | | | | | 37.99 | 42.00 | |
| | 42.00 - 45.00 (00:01) | 100% return Air+Mist (Brown) | | | | | CHALK with large flint bands (driller's description). | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary open hole** | **Comacchio MC450-P1** | **Lee Harris** | **IFoster** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX621** |

| Contract Ref: | Start: **24.04.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **02.05.18** | **79.99** | **E:412751.3 N:141919.2** | **6** of **9** |

| Drilling Progress Log | | Flush Returns & Details | Samples | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | | | | | | |
| | 45.00 - 48.00 (00:02) | 100% return Air+Mist (Brown) | | | | | CHALK with large flint bands (driller's description). *(stratum copied from 42.00m from previous sheet)* | | (6.00) | |
| | | | | | | | Borehole completed at 48.00m depth. | 31.99 | 48.00 | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary open hole** | **Comacchio MC450-P1** | **Lee Harris** | **IFoster** | |

**Appendix 8: RX622 Borehole Log**

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| A303 Stonehenge Phase 6 Ground Investigation | Highways England | RX622 |

| Contract Ref: | Start: 02.05.18 | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| 733442 | End: 02.05.18 | 80.56 | E:412749.8 N:141870.1 | 1 of 9 |

| Drilling Progress Log | | Flush Returns & Details | Samples | | Backfill & Instru-mentation | Water | Description of Strata | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | | | | | | |
| | | | | | | | Brown slightly gravelly sandy SILT. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of chalk and flint. | 80.26 | 0.30 | |
| 0.50 | | | 101 | ES | | | Cream and pale brown structureless CHALK comprising slightly sandy gravelly SILT with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of chalk and rare flint. Cobbles are subangular to subrounded chalk and rare flint. (Grade Dm) | 79.86 | 0.70 | |
| | 1.20 - 3.00 (00:04) | 100% return Air+Mist (White) | | | | | White and cream structureless CHALK comprising slightly sandy silty angular to subrounded fine to coarse GRAVEL of chalk and rare flint. Sand is fine to coarse. (Grade Dc) | | (0.50) | |
| | | | | | | | Weak white CHALK with occasional flints (driller's description). | 79.36 | 1.20 | |
| | 3.00 - 6.00 (00:05) | 100% return Air+Mist (White) | | | | | | | | |
| | 6.00 - 9.00 (00:05) | 90% return Air+Mist (White) | | | | | | | | |

Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 02/05/18 | 11:30 | 7.50 | 3.00 | 146 | 7.50 |
| 02/05/18 | 16:45 | 48.00 | 3.00 | 146 | 7.20 |

## General Remarks

1. Location CAT scanned prior to excavation.
2. First strata encountered excavated by Archaeologists.
3. Hand dug inspection pit to 1.20m depth on 26/03/2018.
4. Groundwater strike at 7.50m depth, rising to 6.90m depth after 20 minutes.
5. Borehole drilled using 146mm open hole rotary bit and air mist as the flush medium.
6. 50mm PVC groundwater monitoring pipe installed as shown.

All dimensions in metres | Scale: 1:50

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Rotary open hole | Comacchio MC450 | Stuart Crawford | IFoster | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX622** |

| Contract Ref: | Start: **02.05.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **02.05.18** | **80.56** | **E:412749.8 N:141870.1** | **2** of **9** |

| Drilling Progress Log | | Flush Returns & Details | Samples | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | | | | | | |
| | 6.00 - 9.00 (00:05) | | | | | | Weak white CHALK with occasional flints (driller's description).<br>*(stratum copied from 1.20m from previous sheet)* | | | |
| | 9.00 - 12.00 (00:06) | 90% return Air+Mist (White) | | | | | | | | |
| | 12.00 - 15.00 (00:05) | 90% return Air+Mist (White) | | | | | | | (28.80) | |
| | 15.00 - 18.00 (00:04) | 80% return Air+Mist (White) | | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary open hole** | **Comacchio MC450** | **Stuart Crawford** | **IFoster** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX622** |

| Contract Ref: | Start: **02.05.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **02.05.18** | **80.56** | **E:412749.8 N:141870.1** | **3** of **9** |

| Drilling Progress Log | | Flush Returns & Details | Samples | | Backfill & Instru-mentation | Water | Description of Strata | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | | | | | | |
| | | | | | | | Weak white CHALK with occasional flints (driller's description).<br>*(stratum copied from 1.20m from previous sheet)* | | | |
| | 18.00 - 21.00 (00:06) | 80% return Air+Mist (White) | | | | | | | | |
| | 21.00 - 24.00 (00:05) | 80% return Air+Mist (White) | | | | | | | | |
| | 24.00 - 27.00 (00:06) | 80% return Air+Mist (White) | | | | | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary open hole** | **Comacchio MC450** | **Stuart Crawford** | **IFoster** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX622** |

| Contract Ref: | Start: **02.05.18** | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **02.05.18** | **80.56** | **E:412749.8 N:141870.1** | **4** of **9** |

| Drilling Progress Log | | Flush Returns & Details | Samples | | Backfill & Instru-mentation | Water | Description of Strata | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | | | | | | |
| | | | | | | | Weak white CHALK with occasional flints (driller's description).<br>*(stratum copied from 1.20m from previous sheet)* | | | |
| | 27.00 - 30.00 (00:07) | 80% return Air+Mist (White) | | | | | | 50.56 | 30.00 | |
| | 30.00 - 33.00 (00:05) | 80% return Air+Mist (Very light brown/yellow/white) | | | | | Weak very light brown/yellowish white CHALK with occasional flints (driller's description). | | | |
| | 33.00 - 36.00 (00:04) | 70% return Air+Mist (Very light brown/yellow/white) | | | | | | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary open hole** | **Comacchio MC450** | **Stuart Crawford** | **IFoster** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX622** |

| Contract Ref: | Start: | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **02.05.18** End: **02.05.18** | **80.56** | **E:412749.8 N:141870.1** | **5** of **9** |

| Drilling Progress Log: Depth | Drilling Progress Log: Drill Time (hh:mm) | Flush Returns & Details | Samples: No | Samples: Type | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Weak very light brown/yellowish white CHALK with occasional flints (driller's description). *(stratum copied from 30.00m from previous sheet)* | | (13.00) | |
| | 36.00 - 39.00 (00:05) | 70% return Air+Mist (Very light brown/yellow/white) | | | | | | | | |
| | 39.00 - 42.00 (00:06) | 70% return Air+Mist (Very light brown/yellow/white) | | | | | | | | |
| | | | | | | | | 37.56 | 43.00 | |
| | 42.00 - 45.00 (00:05) | 60% return Air+Mist (Very light brown/yellow/white) | | | | | Moderately weak light yellowish white CHALK with occasional flints (driller's description). | | (2.00) | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary open hole** | **Comacchio MC450** | **Stuart Crawford** | **IFoster** | |

# STRUCTURAL SOILS

DRAFT

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX622** |

| Contract Ref: | Start: | Ground Level: | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **02.05.18** End: **02.05.18** | **80.56** | **E:412749.8 N:141870.1** | **6** of **9** |

| Drilling Progress Log | | Flush Returns & Details | Samples | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | | | | | | |
| | | | | | | | Moderately weak light yellowish white CHALK with occasional flints (driller's description). *(stratum copied from 43.00m from previous sheet)* | 35.56 | 45.00 | |
| | 45.00 - 48.00 (00:06) | 60% return Air+Mist (Very light brown/yellow/white) | | | | | Moderately weak light yellowish white CHALK with heavy concentration of flints (driller's description). | 32.56 | (3.00) 48.00 | |
| | | | | | | | Borehole terminated at 48.00m depth. | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary open hole** | **Comacchio MC450** | **Stuart Crawford** | **IFoster** | |

**Appendix 9: RX633 Borehole Log**

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX633** |

| Contract Ref: | Start: **25.07.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **26.07.18** | **80.91** | **E:412739.9 N:142040.3** | **1** of **7** |

| Drilling Progress Log | | Flush Returns & Details | Samples & Testing | | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | Results | | | | | | |
| 0.50 | 0.00 - 55.00 (04:20) | 85% return Air+Mist (White) | 101 | ES | | | | Brown sandy SILT. Sand is fine to coarse. (TOPSOIL) | 80.61 | 0.30 | |
| | | | | | | | | Pale brown structureless CHALK composed of slightly sandy gravelly SILT. Gravel is subangular to subrounded fine to medium of chalk and flint. | 80.21 | 0.70 | |
| | | | | | | | | White structureless CHALK composed of slightly sandy SILT with high gravel and cobble content. Sand is fine to medium. Gravel is subangular to subrounded of chalk and flint. Cobbles are subangular to subrounded of flint. | | (0.50) | |
| | | | | | | | | CHALK and FLINT driller's description. | 79.71 | 1.20 | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| 25/07/18 | 16:30 | 55.00 | 18.00 | 146 | - |

## General Remarks

1. Location CAT scanned prior to excavation.
2. First strata encountered excavated by Archaeologists.
3. Hand dug inspection pit to 1.20m depth on 20/07/2018.
4. No groundwater strikes noted by the driller.
5. Borehole drilled using 146mm open hole rotary bit and air mist as the flush medium.
6. 50mm PVC groundwater monitoring pipe installed as shown.

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary openhole drilling** | **Massenza M.I.12** | **Adrian Hopwood** | **SPearce** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX633** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **25.07.18** End: **26.07.18** | **80.91** | **E:412739.9 N:142040.3** | **2** of **7** |

| Drilling Progress Log | | Flush Returns & Details | Samples & Testing | | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | Results | | | | | | |
| | 0.00 - 55.00 (04:20) | 85% return Air+Mist (White) | | | | | | CHALK and FLINT driller's description. *(stratum copied from 1.20m* from previous sheet) | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary openhole drilling** | **Massenza M.I.12** | **Adrian Hopwood** | **SPearce** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX633** |

| Contract Ref: | Start: **25.07.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **26.07.18** | **80.91** | **E:412739.9 N:142040.3** | **3** of **7** |

| Drilling Progress Log | | Flush Returns & Details | Samples & Testing | | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | Results | | | | | | |
| | 0.00 - 55.00 (04:20) | 85% return Air+Mist (White) | | | | | | CHALK and FLINT driller's description. *(stratum copied from 1.20m* from previous sheet) | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary openhole drilling** | **Massenza M.I.12** | **Adrian Hopwood** | **SPearce** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX633** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **25.07.18** End: **26.07.18** | **80.91** | **E:412739.9 N:142040.3** | **4** of **7** |

| Drilling Progress Log | | Flush Returns & Details | Samples & Testing | | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | Results | | | | | | |
| | 0.00 - 55.00 (04:20) | 85% return Air+Mist (White) | | | | | | CHALK and FLINT driller's description. *(stratum copied from 1.20m* from previous sheet) | | (53.80) | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary openhole drilling** | **Massenza M.I.12** | **Adrian Hopwood** | **SPearce** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX633** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **25.07.18** End: **26.07.18** | **80.91** | **E:412739.9 N:142040.3** | **5** of **7** |

| Drilling Progress Log | | Flush Returns & Details | Samples & Testing | | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | Results | | | | | | |
| | 0.00 - 55.00 (04:20) | 85% return Air+Mist (White) | | | | | | CHALK and FLINT driller's description. *(stratum copied from 1.20m* from previous sheet) | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary openhole drilling** | **Massenza M.I.12** | **Adrian Hopwood** | **SPearce** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX633** |

| Contract Ref: | Start: **25.07.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **26.07.18** | **80.91** | **E:412739.9 N:142040.3** | **6** of **7** |

| Drilling Progress Log | | Flush Returns & Details | Samples & Testing | | | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | Results | | | | | | |
| | 0.00 - 55.00 (04:20) | 85% return Air+Mist (White) | | | | | | CHALK and FLINT driller's description. *(stratum copied from 1.20m* from previous sheet) | | | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary openhole drilling** | **Massenza M.I.12** | **Adrian Hopwood** | **SPearce** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **RX633** |

| Contract Ref: | Start: **25.07.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | End: **26.07.18** | **80.91** | **E:412739.9 N:142040.3** | **7** of **7** |

| Drilling Progress Log | | Flush Returns & Details | Samples & Testing | | | Backfill & Instru-mentation | Water | Description of Strata | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Drill Time (hh:mm) | | No | Type | Results | | | | | | |
| | 0.00 - 55.00 (04:20) | 85% return Air+Mist (White) | | | | | | CHALK and FLINT driller's description. *(stratum copied from 1.20m* from previous sheet) | | | |
| | | | | | | | | Borehole terminated at 55.00m depth. | 25.91 | 55.00 | |

| Drilling Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Rotary openhole drilling** | **Massenza M.I.12** | **Adrian Hopwood** | **SPearce** | |

**Appendix 10: W617 Borehole Log**

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **W617** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **20.4.18** End: **3.7.18** | **79.60** | **E:412751.0 N:141968.7** | **1** of **8** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Drill Time (hh:mm) | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.50 | 101 | ES | T,J,V | | | | | 85% return Air+Mist (White) | (02:00) | | | Brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of chalk and flint. | 79.30 | 0.30 | |
| | | | | | | | | | | | | Cream to pale brown slightly gravelly silty fine to coarse SAND with low cobble content. Gravel is angular to subrounded fine to coarse flint and chalk. Cobbles are subangular to subrounded flint. | 78.40 | (0.90) 1.20 | |
| | | | | | | | | | | | | Firm brown chalky CLAY abundant with flints (driller's description). | 77.80 | (0.60) 1.80 | |
| | | | | | | | | | | | | Firm white CHALK with numerous flint (driller's description). | | (3.70) | |
| | | | | | | | | | | | | . . . Rotary drilling techniques used below 5.20m depth. | 74.10 | 5.50 | |
| | | | | | | | | | | | | Firm white CHALK with numerous flint becoming more structured (driller's description). | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 20/04/18 | | 5.50 | 5.50 | 300 | Dry |
| 20/04/18 | 12:10 | 1.20 | 1.20 | 500 | Dry |
| 20/04/18 | 12:30 | 5.00 | 5.00 | 400 | |
| 20/04/18 | 12:40 | 5.50 | 5.50 | 350 | Dry |
| 05/06/18 | 14:30 | 5.50 | 5.50 | 350 | - |
| 05/06/18 | 16:30 | 18.00 | 5.50 | 350 | - |
| 06/06/18 | 08:30 | 18.00 | 5.50 | 350 | 11.45 |
| 06/06/18 | 17:00 | 29.50 | 5.50 | 350 | - |

## Chiselling / Slow Progress

| From | To | Duration (hh:mm) |
|---|---|---|
| | | |

## General Remarks

1. See technique 2
2. Location CAT scanned prior to excavation.
3. First strata encountered excavated by Archaeologists.
4. Hand dug inspection pit to 1.20m depth on 27/03/2018.
5. No groundwater strike noted by the driller.

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| Inspection pit + Cable Percussion + Rotary open hole | Dando 2500 + Massenza M.I.12 | Adam Langford + A. Hopwood | IFoster | [redacted] |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **W617** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **20.4.18** End: **3.7.18** | **79.60** | **E:412751.0 N:141968.7** | **2** of **8** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Drill Time (hh:mm) | Backfill & Instru-mentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 85% return Air+Mist (White) | (02:00) | | | | | (12.50) | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 07/06/18 | 08:30 | 29.50 | 5.50 | 350 | 22.70 |
| 07/06/18 | 14:50 | 35.40 | 5.50 | 350 | - |
| 08/06/18 | 08:30 | 35.40 | 5.50 | 350 | 10.30 |
| 08/06/18 | 13:00 | 36.00 | 5.50 | 350 | - |
| 11/06/18 | 09:30 | 36.00 | 5.50 | 350 | 13.80 |
| 11/06/18 | 09:30 | 36.00 | 5.50 | 350 | - |
| 18/06/18 | 10:45 | 35.50 | 21.00 | 350 | 13.65 |
| 18/06/18 | 17:30 | 35.50 | 21.00 | 350 | - |

## Chiselling / Slow Progress

| From | To | Duration (hh:mm) |
|---|---|---|
| | | |

## General Remarks

6. Cable percussion borehole drilled to 5.00m in 500mm "20 inch" with 404mm "16 inch" casing grouted in to 5.50m depth.
7. Rotary borehole drilled to depth using a 350mm open hole drill bit with air mist used as flush medium.
8. Borehole collapsed subsequent to geologging.

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Cable Percussion + Rotary open hole** | **Dando 2500 + Massenza M.I.12** | **Adam Langford + A. Hopwood** | **IFoster** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **W617** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **20.4.18** End: **3.7.18** | **79.60** | **E:412751.0 N:141968.7** | **3** of **8** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Drill Time (hh:mm) | Backfill & Instrumentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 85% return Air+Mist (White) | (02:00) (04:00) | | | CHALK and FLINT (Driller's Description) | 61.60 | 18.00 | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 19/06/18 | 08:30 | 36.00 | 21.00 | 350 | 13.75 |
| 19/06/18 | 16:30 | 36.50 | 21.00 | 350 | - |
| 20/06/18 | 08:30 | 36.50 | 21.00 | 350 | 13.50 |
| 20/06/18 | 13:05 | 36.50 | 21.00 | 350 | - |
| 21/06/18 | 08:30 | 36.50 | 21.00 | 350 | 13.85 |
| 21/06/18 | 08:30 | 36.50 | 21.00 | 350 | - |
| 22/06/18 | 08:30 | 37.00 | 21.00 | 350 | 13.65 |
| 22/06/18 | 08:30 | 37.00 | 21.00 | 350 | - |

## Chiselling / Slow Progress

| From | To | Duration (hh:mm) |
|---|---|---|
| | | |

## General Remarks

Borehole redrilled to depth using a 350mm "13 3/4 inch" open hole drill bit with air mist used as the flush medium.

9. 300mm PVC water monitoring pipe installed as shown.

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Cable Percussion + Rotary open hole** | **Dando 2500 + Massenza M.I.12** | **Adam Langford + A. Hopwood** | **IFoster** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **W617** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **20.4.18** End: **3.7.18** | **79.60** | **E:412751.0 N:141968.7** | **4** of **8** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Drill Time (hh:mm) | Backfill & Instru-mentation | Water | Description of Strata | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 85% return Air+Mist (White) | (04:00) | | | | | (20.50) | |
| | | | | | | | | 85% return Air+Mist (White) | (04:30) | | | | | | |

## Boring Progress and Water Observations

| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
|---|---|---|---|---|---|
| 25/06/18 | 08:30 | 37.00 | 21.00 | 350 | 11.65 |
| 25/06/18 | 16:00 | 37.00 | 21.00 | 350 | - |
| 29/06/18 | 09:30 | 38.50 | 38.50 | 350 | 11.70 |
| 29/06/18 | 17:30 | 44.50 | 38.50 | 350 | - |
| 02/07/18 | 10:10 | 44.50 | 44.70 | 350 | 11.80 |
| 02/07/18 | 17:30 | 46.80 | 44.70 | 350 | - |
| 03/07/18 | 09:15 | 46.80 | 46.70 | 350 | 11.84 |
| 03/07/18 | 17:30 | 48.80 | 46.70 | 350 | - |

## Chiselling / Slow Progress

| From | To | Duration (hh:mm) |
|---|---|---|
| | | |

## General Remarks

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Cable Percussion + Rotary open hole** | **Dando 2500 + Massenza M.I.12** | **Adam Langford + A. Hopwood** | **IFoster** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **W617** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **20.4.18** End: **3.7.18** | **79.60** | **E:412751.0 N:141968.7** | **5** of **8** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Drill Time (hh:mm) | Backfill & Instru-mentation | Water | Description of Strata | Reduced Level | Depth (Thickness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 85% return Air+Mist (White) | (01:30) | | | | | | |
| | | | | | | | | 85% return Air+Mist (White) | (01:00) | | | | | | |
| | | | | | | | | 85% return Air+Mist (White) | (00:10) | | | | | | |
| | | | | | | | | | | | | | 41.10 | 38.50 | |
| | | | | | | | | | | | | Hard white CHALK with frequent bands of small cobble sized flint (driller's description). | | (6.00) | |
| | | | | | | | | | | | | | 35.10 | 44.50 | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth |
| | | | | | |

| Chiselling / Slow Progress | | |
|---|---|---|
| From | To | Duration (hh:mm) |
| | | |

**General Remarks**

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Cable Percussion + Rotary open hole** | **Dando 2500 + Massenza M.I.12** | **Adam Langford + A. Hopwood** | **IFoster** | |

# STRUCTURAL SOILS

**FINAL**

# BOREHOLE LOG

| Contract: | Client: | Borehole: |
|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | **Highways England** | **W617** |

| Contract Ref: | Start: | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
|---|---|---|---|---|
| **733442** | **20.4.18** End: **3.7.18** | **79.60** | **E:412751.0 N:141968.7** | **6** of **8** |

| Depth (m) | Samples & Testing: No | Type | Results | Mechanical Log: TCR (%) | SCR (%) | RQD (%) | If (mm) | Flush Returns & Details | Drill Time (hh:mm) | Backfill & Instru-mentation | Water | Description of Strata | Reduced Level | Depth (Thick ness) | Material Graphic Legend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Hard white CHALK with abundant bands of small cobble sized flint (driller's description). | | (4.30) | |
| | | | | | | | | | | | | | 30.80 | 48.80 | |
| | | | | | | | | | | | | Borehole terminated at 48.80m depth. | | | |

| Boring Progress and Water Observations | | | | | | Chiselling / Slow Progress | | | General Remarks |
|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Borehole Depth | Casing Depth | Borehole Diameter (mm) | Water Depth | From | To | Duration (hh:mm) | |
| | | | | | | | | | |

All dimensions in metres | Scale: **1:50**

| Method Used: | Plant Used: | Drilled By: | Logged By: | Checked By: |
|---|---|---|---|---|
| **Inspection pit + Cable Percussion + Rotary open hole** | **Dando 2500 + Massenza M.I.12** | **Adam Langford + A. Hopwood** | **IFoster** | |

# STRUCTURAL SOILS

FINAL

# BOREHOLE LOG

| Contract: | | Client: | | Borehole: |
|---|---|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | | **Highways England** | | **W617** |
| Contract Ref: | Start: **20.4.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
| **733442** | End: **3.7.18** | **79.60** | **E:412751.0 N:141968.7** | **7** of **8** |

W617 Pit 1

W617 Pit 2

| Method Used: | Inspection pit + Cable Percussion + Rotary open hole | Plant Used: | Dando 2500 + Massenza M.I.12 | Drilled By: | Adam Langford + A. Hopwood | Logged By: | IFoster | Checked By: | |
|---|---|---|---|---|---|---|---|---|---|

# STRUCTURAL SOILS

FINAL

# BOREHOLE LOG

| Contract: | | Client: | | Borehole: |
|---|---|---|---|---|
| **A303 Stonehenge Phase 6 Ground Investigation** | | **Highways England** | | **W617** |
| Contract Ref: | Start: **20.4.18** | Ground Level (m AOD): | National Grid Co-ordinate: | Sheet: |
| **733442** | End: **3.7.18** | **79.60** | **E:412751.0 N:141968.7** | **8** of **8** |

W617 Spoil

| Method Used: | Inspection pit + Cable Percussion + Rotary open hole | Plant Used: | Dando 2500 + Massenza M.I.12 | Drilled By: | Adam Langford + A. Hopwood | Logged By: | IFoster | Checke By: | |
|---|---|---|---|---|---|---|---|---|---|

**Appendix 11: 210317-67 Groundwater Analysis Report**

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

RPS Consultants Ltd
260 Park Avenue
Aztec West
Almondsbury
Bristol
BS32 4SY

**Attention:** Benjamin Briere

# CERTIFICATE OF ANALYSIS

| | |
|---|---|
| **Date of report Generation:** | 24 March 2021 |
| **Customer:** | RPS Consultants Ltd |
| **Sample Delivery Group (SDG):** | 210317-67 |
| **Your Reference:** | JFR1451 |
| **Location:** | A303 Stonehenge |
| **Report No:** | 591965 |

We received 1 sample on Wednesday March 17, 2021 and 1 of these samples were scheduled for analysis which was completed on Wednesday March 24, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.


Approved By:

**Sonia McWhan**

Operations Manager

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## Received Sample Overview

| Lab Sample No(s) | Customer Sample Ref. | AGS Ref. | Depth (m) | Sampled Date |
|---|---|---|---|---|
| 23914784 | W617 | | | 16/03/2021 |

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

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| | | | | | |
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| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

**Results Legend**

X Test

N No Determination Possible

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

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lab Sample No(s)** | | | 23914784 | | | | | | | |
| **Customer Sample Reference** | | | W617 | | | | | | | |
| **AGS Reference** | | | | | | | | | | |
| **Depth (m)** | | | | | | | | | | |
| **Container** | | | 0.5l glass bottle (ALE227) | 250ml Amber Gl. PTFE/PE | 330ml plastic bottle (ALE503) | DO KIT + DO 250 ml glass | H2SO4 (ALE244) | HNO3 Filtered (ALE204) | NaOH (ALE245) |
| **Sample Type** | | | GW | GW | GW | GW | GW | GW | GW |
| Alkalinity as CaCO3 | All | NDPs: 0 Tests: 1 | | | X | | | | |
| Ammoniacal Nitrogen | All | NDPs: 0 Tests: 1 | | | | | X | | |
| Anions by Kone (w) | All | NDPs: 0 Tests: 1 | | | X | | | | |
| Chromium III | All | NDPs: 0 Tests: 1 | | | | | | X | |
| Conductivity (at 20 deg.C) | All | NDPs: 0 Tests: 1 | | | X | | | | |
| Cyanide Comp/Free/Total/Thiocyanate | All | NDPs: 0 Tests: 1 | | | | | | | X |
| Dissolved Metals by ICP-MS | All | NDPs: 0 Tests: 1 | | | | | | X | |
| Dissolved Organic/Inorganic Carbon | All | NDPs: 0 Tests: 1 | X | | | | | | |
| Dissolved Oxygen by Titration | All | NDPs: 0 Tests: 1 | | | | X | | | |
| EPH CWG (Aliphatic) Aqueous GC (W) | All | NDPs: 0 Tests: 1 | | X | | | | | |
| EPH CWG (Aromatic) Aqueous GC (W) | All | NDPs: 0 Tests: 1 | | X | | | | | |
| Fluoride | All | NDPs: 0 Tests: 1 | | | X | | | | |
| GRO by GC-FID (W) | All | NDPs: 0 Tests: 1 | X | | | | | | |
| Hexavalent Chromium (w) | All | NDPs: 0 Tests: 1 | | | X | | | | |
| Mercury Dissolved | All | NDPs: 0 Tests: 1 | | | | | | X | |

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N No Determination Possible

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SL - Sludge
G - Gas
OTH - Other

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|---|---|---|---|---|---|---|---|---|---|
| **Lab Sample No(s)** | | | 23914784 | | | | | | |
| **Customer Sample Reference** | | | W617 | | | | | | |
| **AGS Reference** | | | | | | | | | |
| **Depth (m)** | | | | | | | | | |
| **Container** | | | 0.5l glass bottle (ALE227) | 250ml Amber Gl. PTFE/PE | 330ml plastic bottle (ALE503) | DO KIT + DO 250 ml glass | H2SO4 (ALE244) | HNO3 Filtered (ALE204) | NaOH (ALE245) |
| **Sample Type** | | | GW | GW | GW | GW | GW | GW | GW |
| Nitrite by Kone (w) | All | NDPs: 0 Tests: 1 | | | | | | | X |
| PAH Spec MS - Aqueous (W) | All | NDPs: 0 Tests: 1 | | X | | | | | |
| PCB Congeners - Aqueous (W) | All | NDPs: 0 Tests: 1 | | X | | | | | |
| Pesticides (Suite I) by GCMS | All | NDPs: 0 Tests: 1 | X | | | | | | |
| Pesticides (Suite II) by GCMS | All | NDPs: 0 Tests: 1 | X | | | | | | |
| pH Value | All | NDPs: 0 Tests: 1 | | | X | | | | |
| Phenols by HPLC (W) | All | NDPs: 0 Tests: 1 | | | | | X | | |
| Phosphate by Kone (w) | All | NDPs: 0 Tests: 1 | | | X | | | | |
| SVOC MS (W) - Aqueous | All | NDPs: 0 Tests: 1 | X | | | | | | |
| Total Dissolved Solids | All | NDPs: 0 Tests: 1 | | | X | | | | |
| TPH CWG (W) | All | NDPs: 0 Tests: 1 | X | | | | | | |
| Turbidity in waters | All | NDPs: 0 Tests: 1 | | | X | | | | |
| VOC MS (W) | All | NDPs: 0 Tests: 1 | X | | | | | | |

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| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

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

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Customer Sample Ref.** | W617 | | | | | | | |
| **Depth (m)** | . | | | | | | | |
| **Sample Type** | Ground Water (GW) | | | | | | | |
| **Date Sampled** | 16/03/2021 | | | | | | | |
| **Sampled Time** | 13:30:00 | | | | | | | |
| **Date Received** | 17/03/2021 | | | | | | | |
| **SDG Ref** | 210317-67 | | | | | | | |
| **Lab Sample No.(s)** | 23914784 | | | | | | | |
| **AGS Reference** | | | | | | | | |
| **Component** | **LOD/Units** | **Method** | | | | | | |
| Alkalinity, Total as CaCO3 | <2 mg/l | TM043 | 230 | | | | | |
| Alkalinity, Bicarbonate as CaCO3 | <2 mg/l | TM043 | 230 | | | | | |
| Alkalinity, Carbonate as CaCO3 | <2 mg/l | TM043 | <2 | | | | | |
| Carbon, Organic (diss.filt) | <3 mg/l | TM090 | <3 | | | | | |
| Ammoniacal Nitrogen as N | <0.2 mg/l | TM099 | <0.2 | | | | | |
| Fluoride | <0.5 mg/l | TM104 | <0.5 | | | | | |
| Conductivity @ 20 deg.C | <0.02 mS/cm | TM120 | 0.612 | | | | | |
| Dissolved solids, Total (meter) | <5 mg/l | TM123 | 465 | | | | | |
| Chromium, Trivalent | <0.03 mg/l | TM152 | <0.03 | | | | | |
| Antimony (diss.filt) | <1 µg/l | TM152 | <1 | | | | | |
| Arsenic (diss.filt) | <0.5 µg/l | TM152 | <0.5 | | | | | |
| Beryllium (diss.filt) | <0.1 µg/l | TM152 | <0.1 | | | | | |
| Boron (diss.filt) | <10 µg/l | TM152 | 16.8 | | | | | |
| Cadmium (diss.filt) | <0.08 µg/l | TM152 | <0.08 | | | | | |
| Chromium (diss.filt) | <1 µg/l | TM152 | <1 | | | | | |
| Copper (diss.filt) | <0.3 µg/l | TM152 | 2.74 | | | | | |
| Lead (diss.filt) | <0.2 µg/l | TM152 | 0.545 | | | | | |
| Manganese (diss.filt) | <3 µg/l | TM152 | <3 | | | | | |
| Molybdenum (diss.filt) | <3 µg/l | TM152 | <3 | | | | | |
| Nickel (diss.filt) | <0.4 µg/l | TM152 | 2.02 | | | | | |
| Phosphorus (diss.filt) | <10 µg/l | TM152 | 16.6 | | | | | |
| Selenium (diss.filt) | <1 µg/l | TM152 | <1 | | | | | |
| Zinc (diss.filt) | <1 µg/l | TM152 | 54.5 | | | | | |
| Sodium (Dis.Filt) | <0.076 mg/l | TM152 | 31.9 | | | | | |
| Magnesium (Dis.Filt) | <0.036 mg/l | TM152 | 1.61 | | | | | |
| Potassium (Dis.Filt) | <0.2 mg/l | TM152 | 0.594 | | | | | |
| Calcium (Dis.Filt) | <0.2 mg/l | TM152 | 102 | | | | | |
| Iron (Dis.Filt) | <0.019 mg/l | TM152 | <0.019 | | | | | |
| Mercury (diss.filt) | <0.01 µg/l | TM183 | <0.01 | | | | | |
| Nitrite as NO2 | <0.05 mg/l | TM184 | <0.05 | | | | | |
| Phosphate (Ortho as PO4) | <0.05 mg/l | TM184 | <0.05 | | | | | |
| Sulphate | <2 mg/l | TM184 | 20.6 | | | | | |

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| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

**Results Legend**

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

| Component | LOD/Units | Method | Customer Sample Ref. | Depth (m) | Sample Type | Date Sampled | Sampled Time | Date Received | SDG Ref | Lab Sample No.(s) | AGS Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | W617 | . | Ground Water (GW) | 16/03/2021 | 13:30:00 | 17/03/2021 | 210317-67 | 23914784 | |
| Chloride | <2 mg/l | TM184 | 43.5 | | | | | | | | |
| Phosphate (Ortho as P) | <0.02 mg/l | TM184 | <0.02 | | | | | | | | |
| Nitrate as NO3 | <0.3 mg/l | TM184 | 35.6 | | | | | | | | |
| Oxygen, dissolved | <0.3 mg/l | TM187 | 9.69 | | | | | | | | |
| Turbidity | <0.1 ntu | TM195 | 15.2 | | | | | | | | |
| PCB congener 28 | <0.015 µg/l | TM197 | <0.015 | | | | | | | | |
| PCB congener 52 | <0.015 µg/l | TM197 | <0.015 | | | | | | | | |
| PCB congener 101 | <0.015 µg/l | TM197 | <0.015 | | | | | | | | |
| PCB congener 118 | <0.015 µg/l | TM197 | <0.015 | | | | | | | | |
| PCB congener 138 | <0.015 µg/l | TM197 | <0.015 | | | | | | | | |
| PCB congener 153 | <0.015 µg/l | TM197 | <0.015 | | | | | | | | |
| PCB congener 180 | <0.015 µg/l | TM197 | <0.015 | | | | | | | | |
| Sum of detected EC7 PCB's | <0.105 µg/l | TM197 | <0.105 | | | | | | | | |
| Cyanide, Total | <0.05 mg/l | TM227 | <0.05 | | | | | | | | |
| Cyanide, Free | <0.05 mg/l | TM227 | <0.05 | | | | | | | | |
| Chromium, Hexavalent | <0.03 mg/l | TM241 | <0.03 | | | | | | | | |
| pH | <1 pH Units | TM256 | 7.63 | | | | | | | | |
| Phenol | <0.002 mg/l | TM259 | <0.002 | | | | | | | | |
| Cresols | <0.006 mg/l | TM259 | <0.006 | | | | | | | | |
| Xylenols | <0.008 mg/l | TM259 | <0.008 | | | | | | | | |
| Phenols, Total Detected monohydric | <0.016 mg/l | TM259 | <0.016 | | | | | | | | |
| Trifluralin | <0.01 µg/l | TM343 | <0.01 | | | | | | | | |
| alpha-HCH | <0.01 µg/l | TM343 | <0.01 | | | | | | | | |
| gamma-HCH (Lindane) | <0.01 µg/l | TM343 | <0.01 | | | | | | | | |
| Heptachlor | <0.01 µg/l | TM343 | <0.01 | | | | | | | | |
| Aldrin | <0.01 µg/l | TM343 | <0.01 | | | | | | | | |
| beta-HCH | <0.01 µg/l | TM343 | <0.01 | | | | | | | | |
| Isodrin | <0.01 µg/l | TM343 | <0.01 | | | | | | | | |
| delta-HCH | <0.01 µg/l | TM343 | <0.01 | | | | | | | | |
| Heptachlor epoxide | <0.01 µg/l | TM343 | <0.01 | | | | | | | | |
| o,p'-DDE | <0.01 µg/l | TM343 | <0.01 | | | | | | | | |
| Endosulphan I | <0.01 µg/l | TM343 | <0.01 | | | | | | | | |

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**Results Legend**

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| (F) | Trigger breach confirmed |
| 1-4+5@ | Sample deviation (see appendix) |

| | | | |
|---|---|---|---|
| **Customer Sample Ref.** | | | W617 |
| **Depth (m)** | | | . |
| **Sample Type** | | | Ground Water (GW) |
| **Date Sampled** | | | 16/03/2021 |
| **Sampled Time** | | | 13:30:00 |
| **Date Received** | | | 17/03/2021 |
| **SDG Ref** | | | 210317-67 |
| **Lab Sample No.(s)** | | | 23914784 |
| **AGS Reference** | | | |
| **Component** | **LOD/Units** | **Method** | |
| trans-Chlordane | <0.01 µg/l | TM343 | <0.01 |
| cis-Chlordane | <0.01 µg/l | TM343 | <0.01 |
| p,p'-DDE | <0.01 µg/l | TM343 | <0.01 |
| Dieldrin | <0.01 µg/l | TM343 | <0.01 |
| o,p'-DDD (TDE) | <0.01 µg/l | TM343 | <0.01 |
| Endrin | <0.01 µg/l | TM343 | <0.02 |
| o,p'-DDT | <0.01 µg/l | TM343 | <0.02 |
| p,p'-DDD (TDE) | <0.01 µg/l | TM343 | <0.01 |
| Endosulphan II | <0.02 µg/l | TM343 | <0.02 |
| p,p'-DDT | <0.01 µg/l | TM343 | <0.02 |
| o,p'-Methoxychlor | <0.01 µg/l | TM343 | <0.02 |
| p,p'-Methoxychlor | <0.01 µg/l | TM343 | <0.03 |
| Endosulphan Sulphate | <0.02 µg/l | TM343 | <0.04 |
| Permethrin I | <0.01 µg/l | TM343 | <0.01 |
| Permethrin II | <0.01 µg/l | TM343 | <0.01 |
| 1,3,5-Trichlorobenzene | <0.01 µg/l | TM344 | <0.01 |
| Hexachlorobutadiene | <0.01 µg/l | TM344 | <0.01 |
| 1,2,4-Trichlorobenzene | <0.01 µg/l | TM344 | <0.01 |
| 1,2,3-Trichlorobenzene | <0.01 µg/l | TM344 | <0.01 |
| Dichlorvos | <0.01 µg/l | TM344 | <0.01 |
| Dichlobenil | <0.01 µg/l | TM344 | <0.01 |
| Mevinphos | <0.01 µg/l | TM344 | <0.01 |
| Tecnazene | <0.01 µg/l | TM344 | <0.01 |
| Hexachlorobenzene | <0.01 µg/l | TM344 | <0.01 |
| Demeton-S-methyl | <0.01 µg/l | TM344 | <0.01 |
| Phorate | <0.01 µg/l | TM344 | <0.01 |
| Diazinon | <0.01 µg/l | TM344 | <0.01 |
| Triallate | <0.01 µg/l | TM344 | <0.01 |
| Atrazine | <0.01 µg/l | TM344 | <0.01 |
| Simazine | <0.01 µg/l | TM344 | <0.01 |
| Disulfoton | <0.01 µg/l | TM344 | <0.01 |
| Propetamphos | <0.01 µg/l | TM344 | <0.01 |

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| **Sample Type** | Ground Water (GW) | | | | | | | |
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| **Sampled Time** | 13:30:00 | | | | | | | |
| **Date Received** | 17/03/2021 | | | | | | | |
| **SDG Ref** | 210317-67 | | | | | | | |
| **Lab Sample No.(s)** | 23914784 | | | | | | | |
| **AGS Reference** | | | | | | | | |
| **Component** | **LOD/Units** | **Method** | | | | | | |
| Chlorpyriphos-methyl | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Dimethoate | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Pirimiphos-methyl | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Chlorpyriphos | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Methyl Parathion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Malathion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Fenthion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Fenitrothion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Triadimefon | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Pendimethalin | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Parathion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Chlorfenvinphos | <0.01 µg/l | TM344 | <0.01 | | | | | |
| trans-Chlordane | <0.01 µg/l | TM344 | <0.01 | | | | | |
| cis-Chlordane | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Ethion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Carbophenothion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Triazophos | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Phosalone | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Azinphos methyl | <0.02 µg/l | TM344 | <0.02 | | | | | |
| Azinphos ethyl | <0.02 µg/l | TM344 | <0.02 | | | | | |

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## PAH Spec MS - Aqueous (W)

**Results Legend**

| | |
|---|---|
| # | ISO17025 accredited. |
| M | *m*CERTS accredited. |
| aq | Aqueous / settled sample. |
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| * | Subcontracted - refer to subcontractor report for accreditation status. |
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| (F) | Trigger breach confirmed |
| 1-4+5@ | Sample deviation (see appendix) |

| Component | LOD/Units | Method | Customer Sample Ref. | Depth (m) | Sample Type | Date Sampled | Sampled Time | Date Received | SDG Ref | Lab Sample No.(s) | AGS Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | W617 | . | Ground Water (GW) | 16/03/2021 | 13:30:00 | 17/03/2021 | 210317-67 | 23914784 | |
| Naphthalene (aq) | <0.01 µg/l | TM178 | <0.01 | | | | | | | | |
| Acenaphthene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Acenaphthylene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Fluoranthene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Anthracene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Phenanthrene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Fluorene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Chrysene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Pyrene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Benzo(a)anthracene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Benzo(b)fluoranthene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Benzo(k)fluoranthene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Benzo(a)pyrene (aq) | <0.002 µg/l | TM178 | <0.002 | | | | | | | | |
| Dibenzo(a,h)anthracene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Benzo(g,h,i)perylene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| Indeno(1,2,3-cd)pyrene (aq) | <0.005 µg/l | TM178 | <0.005 | | | | | | | | |
| PAH, Total Detected USEPA 16 (aq) | <0.082 µg/l | TM178 | <0.082 | | | | | | | | |

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|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## SVOC MS (W) - Aqueous

**Results Legend**

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

| | |
|---|---|
| **Customer Sample Ref.** | W617 |
| **Depth (m)** | . |
| **Sample Type** | Ground Water (GW) |
| **Date Sampled** | 16/03/2021 |
| **Sampled Time** | 13:30:00 |
| **Date Received** | 17/03/2021 |
| **SDG Ref** | 210317-67 |
| **Lab Sample No.(s)** | 23914784 |
| **AGS Reference** | |

| Component | LOD/Units | Method | |
|---|---|---|---|
| 1,2,4-Trichlorobenzene (aq) | <1 µg/l | TM176 | <1 |
| 1,2-Dichlorobenzene (aq) | <1 µg/l | TM176 | <1 |
| 1,3-Dichlorobenzene (aq) | <1 µg/l | TM176 | <1 |
| 1,4-Dichlorobenzene (aq) | <1 µg/l | TM176 | <1 |
| 2,4,5-Trichlorophenol (aq) | <1 µg/l | TM176 | <1 |
| 2,4,6-Trichlorophenol (aq) | <1 µg/l | TM176 | <1 |
| 2,4-Dichlorophenol (aq) | <1 µg/l | TM176 | <1 |
| 2,4-Dimethylphenol (aq) | <1 µg/l | TM176 | <1 |
| 2,4-Dinitrotoluene (aq) | <1 µg/l | TM176 | <1 |
| 2,6-Dinitrotoluene (aq) | <1 µg/l | TM176 | <1 |
| 2-Chloronaphthalene (aq) | <1 µg/l | TM176 | <1 |
| 2-Chlorophenol (aq) | <1 µg/l | TM176 | <1 |
| 2-Methylnaphthalene (aq) | <1 µg/l | TM176 | <1 |
| 2-Methylphenol (aq) | <1 µg/l | TM176 | <1 |
| 2-Nitroaniline (aq) | <1 µg/l | TM176 | <1 |
| 2-Nitrophenol (aq) | <1 µg/l | TM176 | <1 |
| 3-Nitroaniline (aq) | <1 µg/l | TM176 | <1 |
| 4-Bromophenylphenylether (aq) | <1 µg/l | TM176 | <1 |
| 4-Chloro-3-methylphenol (aq) | <1 µg/l | TM176 | <1 |
| 4-Chloroaniline (aq) | <1 µg/l | TM176 | <1 |
| 4-Chlorophenylphenylether (aq) | <1 µg/l | TM176 | <1 |
| 4-Methylphenol (aq) | <1 µg/l | TM176 | <1 |
| 4-Nitroaniline (aq) | <1 µg/l | TM176 | <1 |
| 4-Nitrophenol (aq) | <1 µg/l | TM176 | <1 |
| Azobenzene (aq) | <1 µg/l | TM176 | <1 |
| Acenaphthylene (aq) | <1 µg/l | TM176 | <1 |
| Acenaphthene (aq) | <1 µg/l | TM176 | <1 |
| Anthracene (aq) | <1 µg/l | TM176 | <1 |
| bis(2-Chloroethyl)ether (aq) | <1 µg/l | TM176 | <1 |
| bis(2-Chloroethoxy)methane (aq) | <1 µg/l | TM176 | <1 |
| bis(2-Ethylhexyl) phthalate (aq) | <2 µg/l | TM176 | 2.27 |
| Butylbenzyl phthalate (aq) | <1 µg/l | TM176 | <1 |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## SVOC MS (W) - Aqueous

**Results Legend**

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

| | |
|---|---|
| **Customer Sample Ref.** | W617 |
| **Depth (m)** | . |
| **Sample Type** | Ground Water (GW) |
| **Date Sampled** | 16/03/2021 |
| **Sampled Time** | 13:30:00 |
| **Date Received** | 17/03/2021 |
| **SDG Ref** | 210317-67 |
| **Lab Sample No.(s)** | 23914784 |
| **AGS Reference** | |

| Component | LOD/Units | Method | |
|---|---|---|---|
| Benzo(a)anthracene (aq) | <1 µg/l | TM176 | <1 |
| Benzo(b)fluoranthene (aq) | <1 µg/l | TM176 | <1 |
| Benzo(k)fluoranthene (aq) | <1 µg/l | TM176 | <1 |
| Benzo(a)pyrene (aq) | <1 µg/l | TM176 | <1 |
| Benzo(g,h,i)perylene (aq) | <1 µg/l | TM176 | <1 |
| Carbazole (aq) | <1 µg/l | TM176 | <1 |
| Chrysene (aq) | <1 µg/l | TM176 | <1 |
| Dibenzofuran (aq) | <1 µg/l | TM176 | <1 |
| n-Dibutyl phthalate (aq) | <1 µg/l | TM176 | <1 |
| Diethyl phthalate (aq) | <1 µg/l | TM176 | <1 |
| Dibenzo(a,h)anthracene (aq) | <1 µg/l | TM176 | <1 |
| Dimethyl phthalate (aq) | <1 µg/l | TM176 | <1 |
| n-Dioctyl phthalate (aq) | <5 µg/l | TM176 | <5 |
| Fluoranthene (aq) | <1 µg/l | TM176 | <1 |
| Fluorene (aq) | <1 µg/l | TM176 | <1 |
| Hexachlorobenzene (aq) | <1 µg/l | TM176 | <1 |
| Hexachlorobutadiene (aq) | <1 µg/l | TM176 | <1 |
| Pentachlorophenol (aq) | <1 µg/l | TM176 | <1 |
| Phenol (aq) | <1 µg/l | TM176 | <1 |
| n-Nitroso-n-dipropylamine (aq) | <1 µg/l | TM176 | <1 |
| Hexachloroethane (aq) | <1 µg/l | TM176 | <1 |
| Nitrobenzene (aq) | <1 µg/l | TM176 | <1 |
| Naphthalene (aq) | <1 µg/l | TM176 | <1 |
| Isophorone (aq) | <1 µg/l | TM176 | <1 |
| Hexachlorocyclopentadiene (aq) | <1 µg/l | TM176 | <1 |
| Phenanthrene (aq) | <1 µg/l | TM176 | <1 |
| Indeno(1,2,3-cd)pyrene (aq) | <1 µg/l | TM176 | <1 |
| Pyrene (aq) | <1 µg/l | TM176 | <1 |
| SVOC TIC (aq) | | TM176 | Not Detected |
| Total SVOC TIC | <10 µg/l | TM176 | <10 |
| | | | |
| | | | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## TPH CWG (W)

**Results Legend**

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

| Component | LOD/Units | Method | Customer Sample Ref. W617 | Depth (m) . | Sample Type Ground Water (GW) | Date Sampled 16/03/2021 | Sampled Time 13:30:00 | Date Received 17/03/2021 | SDG Ref 210317-67 | Lab Sample No.(s) 23914784 | AGS Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GRO Surrogate % recovery** | % | TM245 | 111 | 2 | | | | | | | |
| GRO >C5-C12 | <50 µg/l | TM245 | <50 | 2 | | | | | | | |
| Methyl tertiary butyl ether (MTBE) | <3 µg/l | TM245 | <3 | 2 | | | | | | | |
| Benzene | <7 µg/l | TM245 | <7 | 2 | | | | | | | |
| Toluene | <4 µg/l | TM245 | <4 | 2 | | | | | | | |
| Ethylbenzene | <5 µg/l | TM245 | <5 | 2 | | | | | | | |
| m,p-Xylene | <8 µg/l | TM245 | <8 | 2 | | | | | | | |
| o-Xylene | <3 µg/l | TM245 | <3 | 2 | | | | | | | |
| Sum of detected Xylenes | <11 µg/l | TM245 | <11 | 2 | | | | | | | |
| Sum of detected BTEX | <28 µg/l | TM245 | <28 | 2 | | | | | | | |
| Aliphatics >C5-C6 | <10 µg/l | TM245 | <10 | 2 | | | | | | | |
| Aliphatics >C6-C8 | <10 µg/l | TM245 | <10 | 2 | | | | | | | |
| Aliphatics >C8-C10 | <10 µg/l | TM245 | <10 | 2 | | | | | | | |
| Aliphatics >C10-C12 | <10 µg/l | TM245 | <10 | 2 | | | | | | | |
| Aliphatics >C12-C16 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aliphatics >C16-C21 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aliphatics >C21-C35 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Total Aliphatics >C12-C35 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aromatics >EC5-EC7 | <10 µg/l | TM245 | <10 | 2 | | | | | | | |
| Aromatics >EC7-EC8 | <10 µg/l | TM245 | <10 | 2 | | | | | | | |
| Aromatics >EC8-EC10 | <10 µg/l | TM245 | <10 | 2 | | | | | | | |
| Aromatics >EC10-EC12 | <10 µg/l | TM245 | <10 | 2 | | | | | | | |
| Aromatics >EC12-EC16 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aromatics >EC16-EC21 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aromatics >EC21-EC35 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Total Aromatics >EC12-EC35 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Total Aliphatics & Aromatics >C5-35 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aliphatics >C16-C35 Aqueous | <10 µg/l | TM174 | <10 | | | | | | | | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## VOC MS (W)

**Results Legend**

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

| | |
|---|---|
| **Customer Sample Ref.** | W617 |
| **Depth (m)** | . |
| **Sample Type** | Ground Water (GW) |
| **Date Sampled** | 16/03/2021 |
| **Sampled Time** | 13:30:00 |
| **Date Received** | 17/03/2021 |
| **SDG Ref** | 210317-67 |
| **Lab Sample No.(s)** | 23914784 |
| **AGS Reference** | |

| Component | LOD/Units | Method | | | | | |
|---|---|---|---|---|---|---|---|
| Dibromofluoromethane** | % | TM208 | 122 | 2 | | | |
| Toluene-d8** | % | TM208 | 97.1 | 2 | | | |
| 4-Bromofluorobenzene** | % | TM208 | 100 | 2 | | | |
| Dichlorodifluoromethane | <1 µg/l | TM208 | <1 | 2 | | | |
| Chloromethane | <1 µg/l | TM208 | <1 | 2 | | | |
| Vinyl chloride | <1 µg/l | TM208 | <1 | 2 | | | |
| Bromomethane | <1 µg/l | TM208 | <1 | 2 | | | |
| Chloroethane | <1 µg/l | TM208 | <1 | 2 | | | |
| Trichlorofluoromethane | <1 µg/l | TM208 | <1 | 2 | | | |
| 1,1-Dichloroethene | <1 µg/l | TM208 | <1 | 2 | | | |
| Carbon disulphide | <1 µg/l | TM208 | <1 | 2 | | | |
| Dichloromethane | <3 µg/l | TM208 | <3 | 2 | | | |
| Methyl tertiary butyl ether (MTBE) | <1 µg/l | TM208 | <1 | 2 | | | |
| trans-1,2-Dichloroethene | <1 µg/l | TM208 | <1 | 2 | | | |
| 1,1-Dichloroethane | <1 µg/l | TM208 | <1 | 2 | | | |
| cis-1,2-Dichloroethene | <1 µg/l | TM208 | <1 | 2 | | | |
| 2,2-Dichloropropane | <1 µg/l | TM208 | <1 | 2 | | | |
| Bromochloromethane | <1 µg/l | TM208 | <1 | 2 | | | |
| Chloroform | <1 µg/l | TM208 | <1 | 2 | | | |
| 1,1,1-Trichloroethane | <1 µg/l | TM208 | <1 | 2 | | | |
| 1,1-Dichloropropene | <1 µg/l | TM208 | <1 | 2 | | | |
| Carbontetrachloride | <1 µg/l | TM208 | <1 | 2 | | | |
| 1,2-Dichloroethane | <1 µg/l | TM208 | <1 | 2 | | | |
| Benzene | <1 µg/l | TM208 | <1 | 2 | | | |
| Trichloroethene | <1 µg/l | TM208 | <1 | 2 | | | |
| 1,2-Dichloropropane | <1 µg/l | TM208 | <1 | 2 | | | |
| Dibromomethane | <1 µg/l | TM208 | <1 | 2 | | | |
| Bromodichloromethane | <1 µg/l | TM208 | <1 | 2 | | | |
| cis-1,3-Dichloropropene | <1 µg/l | TM208 | <1 | 2 | | | |
| Toluene | <1 µg/l | TM208 | <1 | 2 | | | |
| trans-1,3-Dichloropropene | <1 µg/l | TM208 | <1 | 2 | | | |
| 1,1,2-Trichloroethane | <1 µg/l | TM208 | <1 | 2 | | | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## VOC MS (W)

**Results Legend**

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

| | |
|---|---|
| **Customer Sample Ref.** | W617 |
| **Depth (m)** | . |
| **Sample Type** | Ground Water (GW) |
| **Date Sampled** | 16/03/2021 |
| **Sampled Time** | 13:30:00 |
| **Date Received** | 17/03/2021 |
| **SDG Ref** | 210317-67 |
| **Lab Sample No.(s)** | 23914784 |
| **AGS Reference** | |

| Component | LOD/Units | Method | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1,3-Dichloropropane | <1 µg/l | TM208 | <1 | 2 | | | | |
| Tetrachloroethene | <1 µg/l | TM208 | <1 | 2 | | | | |
| Dibromochloromethane | <1 µg/l | TM208 | <1 | 2 | | | | |
| 1,2-Dibromoethane | <1 µg/l | TM208 | <1 | 2 | | | | |
| Chlorobenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| 1,1,1,2-Tetrachloroethane | <1 µg/l | TM208 | <1 | 2 | | | | |
| Ethylbenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| m,p-Xylene | <1 µg/l | TM208 | <1 | 2 | | | | |
| o-Xylene | <1 µg/l | TM208 | <1 | 2 | | | | |
| Styrene | <1 µg/l | TM208 | <1 | 2 | | | | |
| Bromoform | <1 µg/l | TM208 | <1 | 2 | | | | |
| Isopropylbenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| 1,1,2,2-Tetrachloroethane | <1 µg/l | TM208 | <1 | 2 | | | | |
| 1,2,3-Trichloropropane | <1 µg/l | TM208 | <1 | 2 | | | | |
| Bromobenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| Propylbenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| 2-Chlorotoluene | <1 µg/l | TM208 | <1 | 2 | | | | |
| 1,3,5-Trimethylbenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| 4-Chlorotoluene | <1 µg/l | TM208 | <1 | 2 | | | | |
| tert-Butylbenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| 1,2,4-Trimethylbenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| sec-Butylbenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| 4-iso-Propyltoluene | <1 µg/l | TM208 | <1 | 2 | | | | |
| 1,3-Dichlorobenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| 1,4-Dichlorobenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| n-Butylbenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| 1,2-Dichlorobenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| 1,2-Dibromo-3-chloropropane | <1 µg/l | TM208 | <1 | 2 | | | | |
| 1,2,4-Trichlorobenzene | <1 µg/l | TM208 | <1 | 2 | | | | |
| Hexachlorobutadiene | <1 µg/l | TM208 | <1 | 2 | | | | |
| tert-Amyl methyl ether (TAME) | <1 µg/l | TM208 | <1 | 2 | | | | |
| Naphthalene | <1 µg/l | TM208 | <1 | 2 | | | | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## VOC MS (W)

**Results Legend**

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

| | |
|---|---|
| **Customer Sample Ref.** | W617 |
| **Depth (m)** | . |
| **Sample Type** | Ground Water (GW) |
| **Date Sampled** | 16/03/2021 |
| **Sampled Time** | 13:30:00 |
| **Date Received** | 17/03/2021 |
| **SDG Ref** | 210317-67 |
| **Lab Sample No.(s)** | 23914784 |
| **AGS Reference** | |

| Component | LOD/Units | Method | | | | | |
|---|---|---|---|---|---|---|---|
| 1,2,3-Trichlorobenzene | <1 µg/l | TM208 | <1 2 | | | | |
| 1,3,5-Trichlorobenzene | <1 µg/l | TM208 | <1 2 | | | | |
| VOC TIC | | TM208 | Not Detected 2 | | | | |
| Sum of detected Xylenes | <2 µg/l | TM208 | <2 2 | | | | |
| Total VOC TIC | <10 µg/l | TM208 | <10 2 | | | | |

# Table of Results - Appendix

| Method No | Reference | Description |
|---|---|---|
| TM043 | Method 2320B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part109 1984 | Determination of alkalinity in aqueous samples |
| TM090 | Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060 | Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water |
| TM099 | BS 2690: Part 7:1968 / BS 6068: Part2.11:1984 | Determination of Ammonium in Water Samples using the Kone Analyser |
| TM104 | Method 4500F, AWWA/APHA, 20th Ed., 1999 | Determination of Fluoride using the Kone Analyser |
| TM120 | Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970 | Determination of Electrical Conductivity using a Conductivity Meter |
| TM123 | BS 2690: Part 121:1981 | The Determination of Total Dissolved Solids in Water |
| TM152 | Method 3125B, AWWA/APHA, 20th Ed., 1999 | Analysis of Aqueous Samples by ICP-MS |
| TM174 | Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria | Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID |
| TM176 | EPA 8270D Semi-Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) | Determination of SVOCs in Water by GCMS |
| TM178 | Modified: US EPA Method 8100 | Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters |
| TM183 | BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3 | Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry |
| TM184 | EPA Methods 325.1 & 325.2, | The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers |
| TM187 | Winkler, L.W, Ber Deutsch. Chem. Ges, 21,2843,1888." | Dissolved Oxygen in Natural and Waste Waters HMSO 1979 ISBN 011 751442 |
| TM195 | Colour and Turbidity of water. Methods for the Examination of Waters and Associated Materials. HMSO, 1981, ISBN 0 11 751955 3. | Determination of Turbidity in Waters & Associated Matrices |
| TM197 | Modified: US EPA Method 8082.EA Method 174 and 5109631 | Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Waters |
| TM208 | Modified: US EPA Method 8260b & 624 | Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters |
| TM227 | Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500. | Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate |
| TM241 | Methods for the Examination of Waters and Associated Materials; Chromium in Raw and Potable Waters and Sewage Effluents 1980. | The Determination of Hexavalent Chromium in Waters and Leachates using the Kone Analyser |
| TM245 | By GC-FID | Determination of GRO by Headspace in waters |
| TM256 | The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4. | Determination of pH in Water and Leachate using the GLpH pH Meter |
| TM259 | by HPLC | Determination of Phenols in Waters and Leachates by HPLC |
| TM343 | EPA 8270D - Semi-Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) | Determination of Selected Pesticides (Suite I) in Liquids by GCMS |
| TM344 | EPA 8270D – Semi-Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) | Determination of selected pesticides (Suite II) by GCMS |

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

# Test Completion Dates

| | |
|---|---|
| **Lab Sample No(s)** | 23914784 |
| **Customer Sample Ref.** | W617 |
| **AGS Ref.** | |
| **Depth** | |
| **Type** | Ground Water |
| Alkalinity as CaCO3 | 22-Mar-2021 |
| Ammoniacal Nitrogen | 19-Mar-2021 |
| Anions by Kone (w) | 18-Mar-2021 |
| Chromium III | 18-Mar-2021 |
| Conductivity (at 20 deg.C) | 19-Mar-2021 |
| Cyanide Comp/Free/Total/Thiocyanate | 19-Mar-2021 |
| Dissolved Metals by ICP-MS | 18-Mar-2021 |
| Dissolved Organic/Inorganic Carbon | 22-Mar-2021 |
| Dissolved Oxygen by Titration | 18-Mar-2021 |
| EPH CWG (Aliphatic) Aqueous GC (W) | 22-Mar-2021 |
| EPH CWG (Aromatic) Aqueous GC (W) | 22-Mar-2021 |
| Fluoride | 18-Mar-2021 |
| GRO by GC-FID (W) | 22-Mar-2021 |
| Hexavalent Chromium (w) | 18-Mar-2021 |
| Mercury Dissolved | 19-Mar-2021 |
| Nitrite by Kone (w) | 18-Mar-2021 |
| PAH Spec MS - Aqueous (W) | 19-Mar-2021 |
| PCB Congeners - Aqueous (W) | 23-Mar-2021 |
| Pesticides (Suite I) by GCMS | 23-Mar-2021 |
| Pesticides (Suite II) by GCMS | 24-Mar-2021 |
| pH Value | 18-Mar-2021 |
| Phenols by HPLC (W) | 19-Mar-2021 |
| Phosphate by Kone (w) | 18-Mar-2021 |
| SVOC MS (W) - Aqueous | 23-Mar-2021 |
| Total Dissolved Solids | 18-Mar-2021 |
| TPH CWG (W) | 22-Mar-2021 |
| Turbidity in waters | 18-Mar-2021 |
| VOC MS (W) | 23-Mar-2021 |

# ASSOCIATED AQC DATA

## Alkalinity as CaCO3

| Component | Method Code | QC 2387 |
|---|---|---|
| Total Alkalinity as CaCO3 | TM043 | **103.54**<br>96.40 : 105.98 |

## Ammoniacal Nitrogen

| Component | Method Code | QC 2367 |
|---|---|---|
| Ammoniacal Nitrogen as N | TM099 | **96.8**<br>91.28 : 106.64 |

## Anions by Kone (w)

| Component | Method Code | QC 2356 |
|---|---|---|
| Chloride | TM184 | **96.5**<br>91.40 : 109.10 |
| Sulphate (soluble) | TM184 | **100.0**<br>91.99 : 109.30 |
| TON as NO3 | TM184 | **102.0**<br>90.35 : 108.35 |

## Conductivity (at 20 deg.C)

| Component | Method Code | QC 2337 |
|---|---|---|
| Conductivity (at 20 deg.C) | TM120 | **103.76**<br>100.75 : 105.26 |

## Cyanide Comp/Free/Total/Thiocyanate

| Component | Method Code | QC 2362 |
|---|---|---|
| Free Cyanide (W) | TM227 | **80.75**<br>91.52 : 123.82 |
| Thiocyanate (W) | TM227 | **101.25**<br>90.50 : 113.00 |
| Total Cyanide (W) | TM227 | **104.75**<br>91.75 : 112.75 |

## Dissolved Metals by ICP-MS

| Component | Method Code | QC 2309 |
|---|---|---|
| Aluminium | TM152 | **102.33**<br>90.98 : 111.82 |
| Antimony | TM152 | **101.17**<br>90.44 : 113.04 |
| Arsenic | TM152 | **100.33**<br>88.00 : 112.00 |

## Dissolved Metals by ICP-MS

| | | QC 2309 |
|---|---|---|
| Barium | TM152 | **102.5**<br>90.20 : 111.19 |
| Beryllium | TM152 | **103.83**<br>87.77 : 113.97 |
| Bismuth | TM152 | **100.83**<br>91.90 : 112.20 |
| Borate | TM152 | **103.09**<br>88.00 : 112.00 |
| Boron | TM152 | **103.0**<br>96.48 : 114.93 |
| Cadmium | TM152 | **101.33**<br>96.43 : 110.53 |
| Calcium | TM152 | **102.0**<br>81.38 : 119.09 |
| Chromium | TM152 | **100.33**<br>91.84 : 108.67 |
| Cobalt | TM152 | **97.17**<br>88.00 : 112.00 |
| Copper | TM152 | **102.17**<br>92.47 : 118.11 |
| Iron | TM152 | **100.67**<br>92.00 : 113.00 |
| Lead | TM152 | **98.83**<br>88.00 : 112.00 |
| Lithium | TM152 | **103.0**<br>91.62 : 113.12 |
| Magnesium | TM152 | **99.33**<br>93.14 : 107.91 |
| Manganese | TM152 | **101.0**<br>95.03 : 110.58 |
| Molybdenum | TM152 | **99.0**<br>88.00 : 112.00 |
| Nickel | TM152 | **101.33**<br>88.00 : 112.00 |
| Phosphorus | TM152 | **100.67**<br>88.00 : 112.00 |
| Potassium | TM152 | **100.67**<br>93.90 : 112.36 |
| Selenium | TM152 | **99.5**<br>91.58 : 115.98 |
| Silver | TM152 | **102.5**<br>88.80 : 122.30 |
| Sodium | TM152 | **99.33**<br>94.28 : 110.71 |
| Strontium | TM152 | **101.33**<br>88.00 : 112.00 |
| Tellurium | TM152 | **103.0**<br>93.32 : 114.66 |
| Thallium | TM152 | **97.5**<br>88.00 : 112.00 |
| Tin | TM152 | **101.0**<br>92.63 : 109.70 |
| Titanium | TM152 | **101.67**<br>95.58 : 111.68 |

## Dissolved Metals by ICP-MS

| | | QC 2309 |
|---|---|---|
| Tungsten | TM152 | **98.83** 81.32 : 124.72 |
| Uranium | TM152 | **100.5** 88.00 : 112.00 |
| Vanadium | TM152 | **105.0** 88.00 : 112.00 |
| Zinc | TM152 | **102.33** 92.98 : 118.95 |

## Dissolved Organic/Inorganic Carbon

| Component | Method Code | QC 2399 |
|---|---|---|
| Dissolved Inorganic Carbon | TM090 | **106.5** 93.58 : 112.28 |
| Dissolved Organic Carbon | TM090 | **102.83** 96.13 : 109.53 |

## EPH CWG (Aliphatic) Aqueous GC (W)

| Component | Method Code | QC 2316 |
|---|---|---|
| Total Aliphatics >C10-C40 | TM174 | **100.83** 69.79 : 134.39 |

## EPH CWG (Aromatic) Aqueous GC (W)

| Component | Method Code | QC 2370 |
|---|---|---|
| Total Aromatics >EC10-EC40 | TM174 | **99.76** 59.92 : 128.54 |

## Fluoride

| Component | Method Code | QC 2379 |
|---|---|---|
| Fluoride | TM104 | **102.0** 96.67 : 108.67 |

## GRO by GC-FID (W)

| Component | Method Code | QC 2364 |
|---|---|---|
| Benzene by GC | TM245 | **112.0** 79.13 : 118.84 |
| Ethylbenzene by GC | TM245 | **113.0** 79.54 : 115.99 |
| m & p Xylene by GC | TM245 | **113.75** 78.44 : 116.32 |

## GRO by GC-FID (W)

| | | QC 2364 |
|---|---|---|
| MTBE GC-FID | TM245 | **106.5** 81.43 : 120.09 |
| o Xylene by GC | TM245 | **112.5** 76.85 : 120.29 |
| QC | TM245 | **115.81** 71.58 : 131.01 |
| Toluene by GC | TM245 | **112.5** 79.00 : 121.96 |

## Hexavalent Chromium (w)

| Component | Method Code | QC 2303 |
|---|---|---|
| Hexavalent Chromium | TM241 | **103.6** 94.17 : 106.17 |

## Mercury Dissolved

| Component | Method Code | QC 2300 |
|---|---|---|
| Mercury Dissolved (CVAF) | TM183 | **93.2** 69.30 : 128.70 |

## PAH Spec MS - Aqueous (W)

| Component | Method Code | QC 2385 |
|---|---|---|
| Acenaphthene by GCMS | TM178 | **103.6** 90.45 : 118.63 |
| Acenaphthylene by GCMS | TM178 | **101.6** 90.13 : 116.27 |
| Anthracene by GCMS | TM178 | **102.0** 92.40 : 114.00 |
| Benz(a)anthracene by GCMS | TM178 | **106.0** 89.51 : 117.69 |
| Benzo(a)pyrene by GCMS | TM178 | **102.0** 89.43 : 118.57 |
| Benzo(b)fluoranthene by GCMS | TM178 | **101.2** 87.80 : 121.80 |
| Benzo(ghi)perylene by GCMS | TM178 | **102.8** 87.10 : 119.30 |
| Benzo(k)fluoranthene by GCMS | TM178 | **108.8** 93.23 : 123.57 |
| Chrysene by GCMS | TM178 | **108.8** 88.68 : 116.92 |
| Dibenzo(ah)anthracene by GCMS | TM178 | **98.8** 86.24 : 118.56 |
| Fluoranthene by GCMS | TM178 | **103.6** 86.04 : 121.96 |
| Fluorene by GCMS | TM178 | **101.2** 90.76 : 121.24 |

## PAH Spec MS - Aqueous (W)

| | | QC 2385 |
|---|---|---|
| Indeno(123cd)pyrene by GCMS | TM178 | **102.8** 88.39 : 119.61 |
| Naphthalene by GCMS | TM178 | **106.8** 89.40 : 121.80 |
| Phenanthrene by GCMS | TM178 | **106.8** 90.41 : 119.19 |
| Pyrene by GCMS | TM178 | **101.6** 91.00 : 120.20 |

## PCB Congeners - Aqueous (W)

| Component | Method Code | QC 2329 |
|---|---|---|
| PCB congener 101 | TM197 | **99.2** 85.28 : 119.60 |
| PCB congener 105 | TM197 | **99.2** 81.16 : 119.80 |
| PCB congener 114 | TM197 | **98.8** 88.32 : 118.08 |
| PCB congener 118 | TM197 | **100.4** 87.76 : 117.04 |
| PCB congener 123 | TM197 | **98.0** 86.80 : 117.28 |
| PCB congener 126 | TM197 | **99.6** 84.56 : 116.00 |
| PCB congener 138 | TM197 | **98.0** 83.00 : 117.80 |
| PCB congener 153 | TM197 | **98.4** 84.12 : 117.00 |
| PCB congener 156 | TM197 | **97.6** 82.24 : 119.20 |
| PCB congener 157 | TM197 | **102.8** 84.96 : 116.40 |
| PCB congener 167 | TM197 | **98.8** 81.64 : 119.32 |
| PCB congener 169 | TM197 | **96.8** 84.60 : 117.96 |
| PCB congener 180 | TM197 | **98.8** 80.40 : 119.04 |
| PCB congener 189 | TM197 | **96.0** 81.56 : 119.00 |
| PCB congener 28 | TM197 | **98.4** 83.20 : 117.04 |
| PCB congener 52 | TM197 | **99.2** 81.84 : 119.52 |
| PCB congener 77 | TM197 | **99.6** 81.96 : 117.24 |
| PCB congener 81 | TM197 | **99.6** 82.28 : 120.20 |

## Pesticides (Suite I) by GCMS

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## Pesticides (Suite I) by GCMS

| Component | Method Code | QC 2319 |
|---|---|---|
| Aldrin - (Inst.) | TM343 | **87.27** 59.75 : 143.00 |
| alpha-HCH - (Inst.) | TM343 | **77.7** 75.13 : 166.63 |
| beta-HCH - (Inst.) | TM343 | **95.44** 85.48 : 166.48 |
| cis-Chlordane - (Inst.) | TM343 | **82.24** 71.70 : 156.00 |
| delta-HCH - (Inst.) | TM343 | **83.15** 83.98 : 156.58 |
| Dieldrin - (Inst.) | TM343 | **84.39** 77.45 : 154.10 |
| Endosulphan I - (Inst.) | TM343 | **87.4** 91.30 : 168.70 |
| Endosulphan II - (Inst.) | TM343 | **95.87** 82.68 : 161.13 |
| Endosulphan Sulphate - (Inst.) | TM343 | **76.21** 69.65 : 165.95 |
| Endrin - (Inst.) | TM343 | **78.71** 81.33 : 178.68 |
| gamma-HCH (Lindane) - (Inst.) | TM343 | **89.33** 83.15 : 175.40 |
| Heptachlor - (Inst.) | TM343 | **88.04** 63.65 : 167.80 |
| Heptachlor epoxide - (Inst.) | TM343 | **84.63** 73.28 : 159.38 |
| Isodrin - (Inst.) | TM343 | **87.13** 58.34 : 153.81 |
| o,p-DDD (TDE) - (Inst.) | TM343 | **82.89** 66.93 : 162.03 |
| o,p-DDE - (Inst.) | TM343 | **83.97** 64.68 : 156.78 |
| o,p-DDT - (Inst.) | TM343 | **77.71** 72.20 : 170.15 |
| o,p-Methoxychlor - (Inst.) | TM343 | **78.3** 73.33 : 171.13 |
| p,p-DDD (TDE) - (Inst.) | TM343 | **81.74** 67.95 : 160.20 |
| p,p-DDE - (Inst.) | TM343 | **82.4** 67.80 : 159.45 |
| p,p-DDT - (Inst.) | TM343 | **80.96** 68.30 : 178.25 |
| p,p-Methoxychlor - (Inst.) | TM343 | **79.59** 66.94 : 176.47 |
| Permethrin I - (Inst.) | TM343 | **90.23** 63.25 : 146.35 |
| Permethrin II - (Inst.) | TM343 | **86.31** 66.00 : 151.80 |
| trans-Chlordane - (Inst.) | TM343 | **80.39** 71.68 : 165.88 |
| Trifluralin - (Inst.) | TM343 | **87.59** 64.73 : 161.48 |

## pH Value

| Component | Method Code | QC 2332 |
|---|---|---|
| pH | TM256 | **100.94**<br>99.33 : 102.54 |

## Phenols by HPLC (W)

| Component | Method Code | QC 2367 |
|---|---|---|
| 2.3.5 Trimethyl-Phenol by HPLC (W) | TM259 | **52.0**<br>77.41 : 127.55 |
| 2-Isopropyl Phenol by HPLC (W) | TM259 | **51.0**<br>82.77 : 126.51 |
| Cresols by HPLC (W) | TM259 | **49.67**<br>76.60 : 126.28 |
| Napthol by HPLC (W) | TM259 | **60.0**<br>75.40 : 129.40 |
| Phenol by HPLC (W) | TM259 | **52.0**<br>85.77 : 125.91 |
| Xylenols by HPLC (W) | TM259 | **51.5**<br>79.09 : 131.82 |

## Phosphate by Kone (w)

| Component | Method Code | QC 2327 |
|---|---|---|
| Phosphate (Ortho as PO4) | TM184 | **98.8**<br>96.40 : 109.60 |

## SVOC MS (W) - Aqueous

| Component | Method Code | QC 2351 |
|---|---|---|
| 4-Bromophenylphenylether | TM176 | **80.8**<br>52.80 : 111.84 |
| Benzo(a)anthracene | TM176 | **81.6**<br>59.28 : 107.76 |
| Benzo(a)pyrene | TM176 | **84.0**<br>54.40 : 105.76 |
| Butylbenzyl phthalate | TM176 | **77.36**<br>51.68 : 117.92 |
| Hexachlorobutadiene | TM176 | **62.16**<br>48.64 : 95.68 |
| Naphthalene | TM176 | **85.6**<br>63.04 : 111.04 |
| Nitrobenzene | TM176 | **87.2**<br>59.92 : 108.40 |
| Phenol | TM176 | **50.96**<br>36.88 : 72.40 |

## Total Dissolved Solids

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## Total Dissolved Solids

| Component | Method Code | QC 2333 |
|---|---|---|
| Total Dissolved Solids | TM123 | **98.4**<br>97.30 : 100.92 |

## Turbidity in waters

| Component | Method Code | QC 2310 |
|---|---|---|
| Turbidity | TM195 | **95.75**<br>83.75 : 121.25 |

## VOC MS (W)

| Component | Method Code | QC 2360 |
|---|---|---|
| 1,1,1,2-Tetrachloroethane | TM208 | **111.0**<br>78.82 : 115.90 |
| 1,1,1-Trichloroethane | TM208 | **104.5**<br>86.83 : 113.41 |
| 1,1-Dichloroethane | TM208 | **98.0**<br>79.99 : 118.57 |
| 1,2-Dichloroethane | TM208 | **107.0**<br>79.35 : 124.02 |
| 2-Chlorotoluene | TM208 | **101.5**<br>79.67 : 114.74 |
| 4-Chlorotoluene | TM208 | **102.5**<br>80.15 : 113.42 |
| Benzene | TM208 | **93.5**<br>82.57 : 114.10 |
| Bromomethane | TM208 | **99.0**<br>78.77 : 123.20 |
| Carbontetrachloride | TM208 | **112.5**<br>79.73 : 118.91 |
| Chlorobenzene | TM208 | **106.0**<br>88.28 : 110.81 |
| Chloroform | TM208 | **104.5**<br>82.31 : 120.71 |
| Chloromethane | TM208 | **102.5**<br>62.46 : 124.98 |
| Cis-1,2-Dichloroethene | TM208 | **96.0**<br>83.75 : 118.91 |
| Dichloromethane | TM208 | **96.5**<br>81.20 : 120.83 |
| Ethylbenzene | TM208 | **97.0**<br>80.54 : 112.31 |
| Hexachlorobutadiene | TM208 | **89.5**<br>73.65 : 117.84 |
| o-Xylene | TM208 | **100.5**<br>86.17 : 109.69 |

## VOC MS (W)

| | | QC 2360 |
|---|---|---|
| p/m-Xylene | TM208 | **94.75**<br>83.09 : 113.86 |
| Tert-butyl methyl ether | TM208 | **86.5**<br>70.94 : 119.66 |
| Tetrachloroethene | TM208 | **105.5**<br>84.41 : 112.73 |
| Toluene | TM208 | **95.5**<br>81.59 : 111.56 |
| Trichloroethene | TM208 | **102.5**<br>79.53 : 112.32 |
| Vinyl Chloride | TM208 | **96.5**<br>71.92 : 126.73 |

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.
The figure detailed is the percentage recovery result for the AQC.
The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

# CERTIFICATE OF ANALYSIS

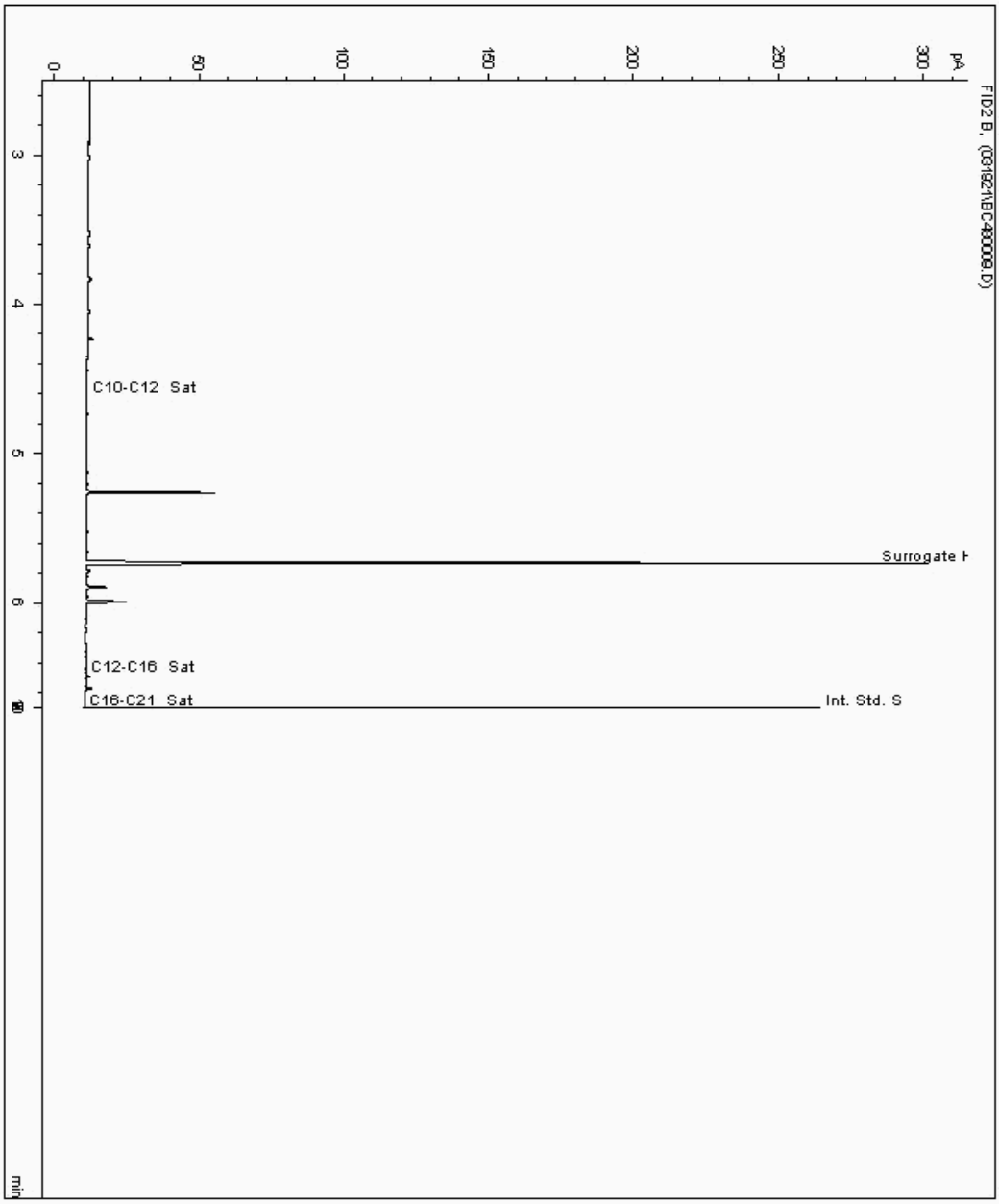
| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## Chromatogram

**Analysis:** EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 23920691 **Depth :**
**Sample ID :** W617

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS ( C12 - C40 )

Sample Identity: 22423691-
Date Acquired : 19/03/2021 22:13:33 PM
Units : ppb
Dilution : SE W617[ ] ->
CF : 1
Multiplier : 0.025



# CERTIFICATE OF ANALYSIS

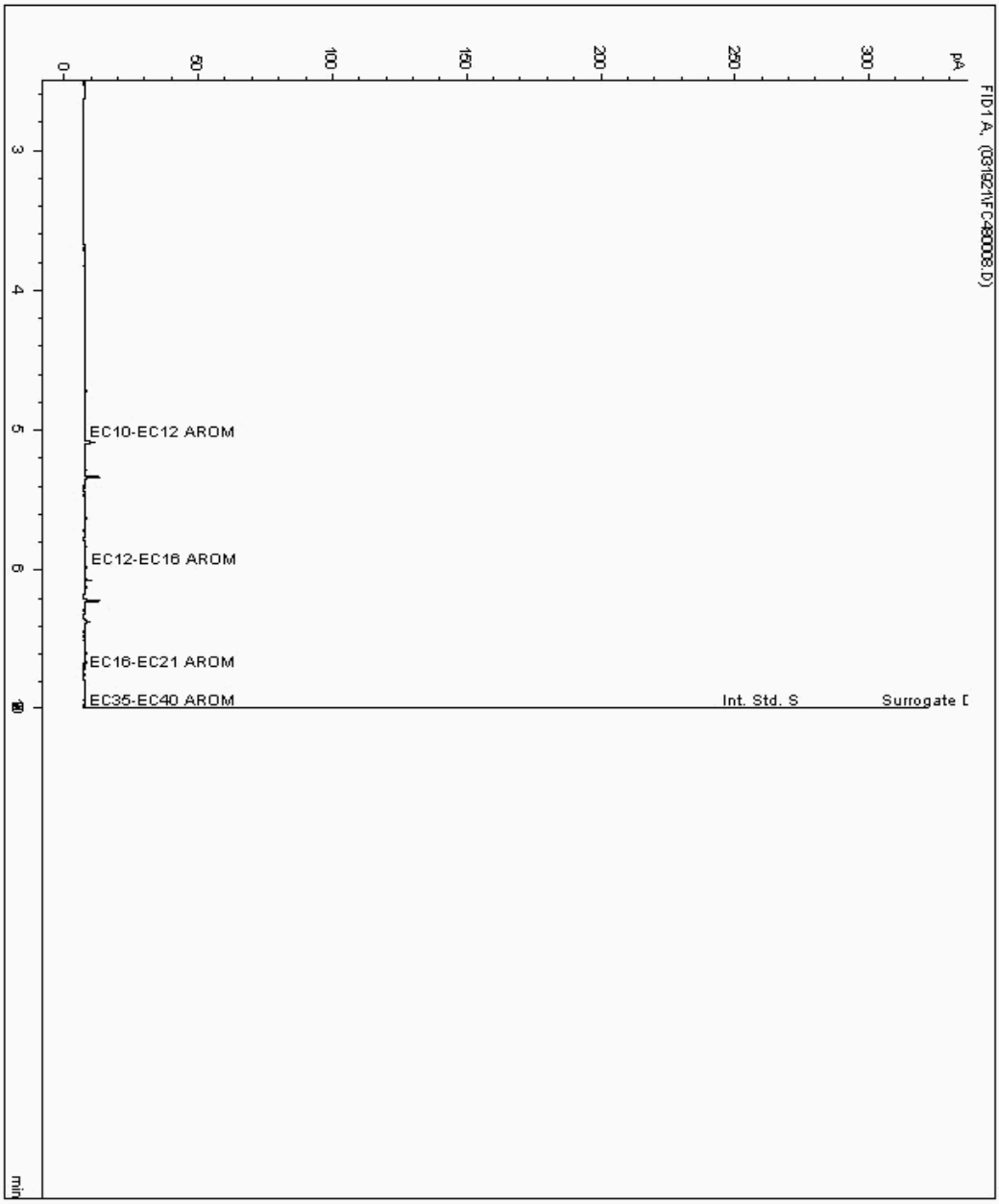
| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## Chromatogram

**Analysis:** EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 23920691 **Depth :**
**Sample ID :** W617

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM ( C12 - C40 )

Sample Identity: 22423692-
Date Acquired : 19/03/2021 21:51:10 PM
Units : ppb
Dilution : SE W617[] ->
CF : 1
Multiplier : 0.025



# CERTIFICATE OF ANALYSIS

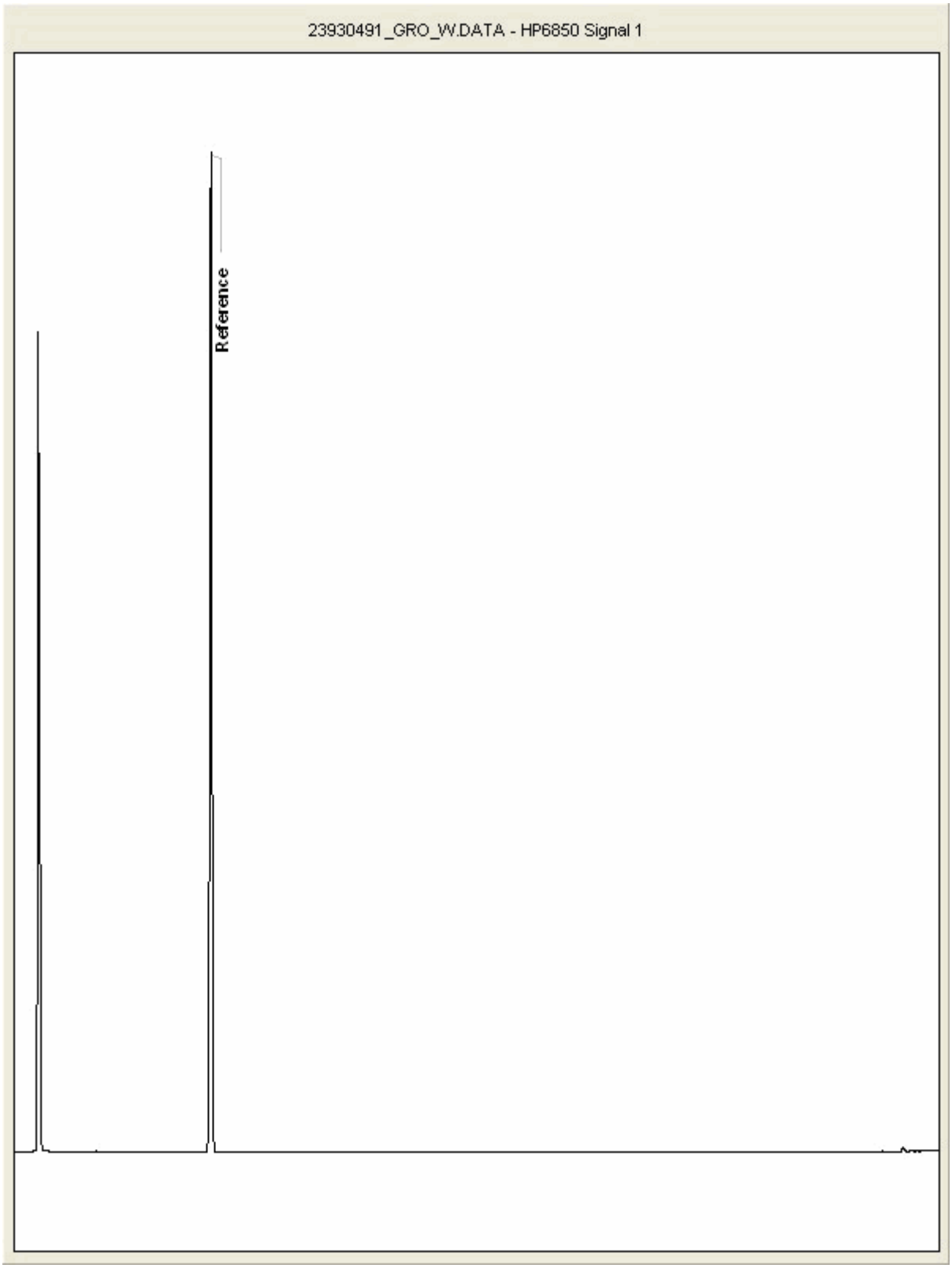
| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210317-67 | **Client Reference:** | JFR1451 | **Report Number:** | 591965 |
| **Location:** | A303 Stonehenge | **Order Number:** | | **Superseded Report:** | |

## Chromatogram

**Analysis:** GRO by GC-FID (W)

**Sample No :** 23930491
**Sample ID :** W617

**Depth :**



# Appendix General

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

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

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

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

7. Results relate only to the items tested.

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

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

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

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

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

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

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

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

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

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

18. **Sample Deviations**

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

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

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

**Identification of Asbestos in Bulk Materials & Soils**

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

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

**Visual Estimation Of Fibre Content**

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

**Respirable Fibres**

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

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

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

**Appendix 12: 210320-39 Groundwater Analysis Report**

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

RPS Consultants Ltd
260 Park Avenue
Aztec West
Almondsbury
Bristol
BS32 4SY

**Attention:** Benjamin Briere

# CERTIFICATE OF ANALYSIS

| | |
|---|---|
| **Date of report Generation:** | 08 April 2021 |
| **Customer:** | RPS Consultants Ltd |
| **Sample Delivery Group (SDG):** | 210320-39 |
| **Your Reference:** | JFR1451 |
| **Location:** | A303 Stonehenge |
| **Report No:** | 593368 |

**This report has been revised and directly supersedes 591829 in its entirety.**

We received 1 sample on Saturday March 20, 2021 and 1 of these samples were scheduled for analysis which was completed on Thursday April 08, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

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

App[redacted]

**Sonia McWhan**

Operations Manager

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## Received Sample Overview

| Lab Sample No(s) | Customer Sample Ref. | AGS Ref. | Depth (m) | Sampled Date |
|---|---|---|---|---|
| 23941073 | W617 | | | 19/03/2021 |

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

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

**Results Legend**

X Test

N No Determination Possible

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

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Lab Sample No(s)** | | | 23941073 | | | | | | |
| **Customer Sample Reference** | | | W617 | | | | | | |
| **AGS Reference** | | | | | | | | | |
| **Depth (m)** | | | | | | | | | |
| **Container** | | | 0.5l glass bottle (ALE227) | 250ml Amber Gl. PTFE/PE | 330ml plastic bottle (ALE503) | 500ml Plastic (ALE208) | H2SO4 (ALE244) | HNO3 Filtered (ALE204) | NaOH (ALE245) |
| **Sample Type** | | | GW | GW | GW | GW | GW | GW | GW |
| Alkalinity as CaCO3 | All | NDPs: 0 Tests: 1 | | | | X | | | |
| Ammoniacal Nitrogen | All | NDPs: 0 Tests: 1 | | | | | X | | |
| Anions by Kone (w) | All | NDPs: 0 Tests: 1 | | | | X | | | |
| Chromium III | All | NDPs: 0 Tests: 1 | | | | | | X | |
| Conductivity (at 20 deg.C) | All | NDPs: 0 Tests: 1 | | | X | | | | |
| Cyanide Comp/Free/Total/Thiocyanate | All | NDPs: 0 Tests: 1 | | | | | | | X |
| Dissolved Metals by ICP-MS | All | NDPs: 0 Tests: 1 | | | | | | X | |
| Dissolved Organic/Inorganic Carbon | All | NDPs: 0 Tests: 1 | X | | | | | | |
| Dissolved Oxygen by Probe | All | NDPs: 0 Tests: 1 | | | X | | | | |
| EPH CWG (Aliphatic) Aqueous GC (W) | All | NDPs: 0 Tests: 1 | | X | | | | | |
| EPH CWG (Aromatic) Aqueous GC (W) | All | NDPs: 0 Tests: 1 | | X | | | | | |
| Fluoride | All | NDPs: 0 Tests: 1 | | | X | | | | |
| GRO by GC-FID (W) | All | NDPs: 0 Tests: 1 | | X | | | | | |
| Hexavalent Chromium (w) | All | NDPs: 0 Tests: 1 | | | X | | | | |
| Mercury Dissolved | All | NDPs: 0 Tests: 1 | | | | | | X | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

**Results Legend**

X Test

N No Determination Possible

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

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Lab Sample No(s)** | | | 23941073 | | | | | | |
| **Customer Sample Reference** | | | W617 | | | | | | |
| **AGS Reference** | | | | | | | | | |
| **Depth (m)** | | | | | | | | | |
| **Container** | | | 0.5l glass bottle (ALE227) | 250ml Amber Gl. PTFE/PE | 330ml plastic bottle (ALE503) | 500ml Plastic (ALE208) | H2SO4 (ALE244) | HNO3 Filtered (ALE204) | NaOH (ALE245) |
| **Sample Type** | | | GW | GW | GW | GW | GW | GW | GW |
| Nitrite by Kone (w) | All | NDPs: 0 Tests: 1 | | | | | | | X |
| PAH Spec MS - Aqueous (W) | All | NDPs: 0 Tests: 1 | | X | | | | | |
| PCB Congeners - Aqueous (W) | All | NDPs: 0 Tests: 1 | | X | | | | | |
| Pesticides (Suite I) by GCMS | All | NDPs: 0 Tests: 1 | X | | | | | | |
| Pesticides (Suite II) by GCMS | All | NDPs: 0 Tests: 1 | X | | | | | | |
| pH Value | All | NDPs: 0 Tests: 1 | | | X | | | | |
| Phenols by HPLC (W) | All | NDPs: 0 Tests: 1 | | | | | X | | |
| Phosphate by Kone (w) | All | NDPs: 0 Tests: 1 | | | | X | | | |
| Sulphide | All | NDPs: 0 Tests: 1 | | | X | | | | |
| Suspended Solids | All | NDPs: 0 Tests: 1 | | | | X | | | |
| SVOC MS (W) - Aqueous | All | NDPs: 0 Tests: 1 | X | | | | | | |
| Total Dissolved Solids | All | NDPs: 0 Tests: 1 | | | | X | | | |
| TPH CWG (W) | All | NDPs: 0 Tests: 1 | X | | | | | | |
| Turbidity in waters | All | NDPs: 0 Tests: 1 | | | | X | | | |
| VOC MS (W) | All | NDPs: 0 Tests: 1 | | X | | | | | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

**Results Legend**

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

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Customer Sample Ref.** | W617 | | | | | | | |
| **Depth (m)** | . | | | | | | | |
| **Sample Type** | Ground Water (GW) | | | | | | | |
| **Date Sampled** | 19/03/2021 | | | | | | | |
| **Sampled Time** | 09:00:00 | | | | | | | |
| **Date Received** | 20/03/2021 | | | | | | | |
| **SDG Ref** | 210320-39 | | | | | | | |
| **Lab Sample No.(s)** | 23941073 | | | | | | | |
| **AGS Reference** | | | | | | | | |
| **Component** | **LOD/Units** | **Method** | | | | | | |
| Suspended solids, Total | <2 mg/l | TM022 | 11.3 # | | | | | |
| Alkalinity, Total as CaCO3 | <2 mg/l | TM043 | 224 # | | | | | |
| Alkalinity, Bicarbonate as CaCO3 | <2 mg/l | TM043 | 224 | | | | | |
| Alkalinity, Carbonate as CaCO3 | <2 mg/l | TM043 | <2 | | | | | |
| Oxygen, dissolved | <0.3 mg/l | TM046 | 10.8 | | | | | |
| Carbon, Organic (diss.filt) | <3 mg/l | TM090 | <3 | | | | | |
| Ammoniacal Nitrogen as N | <0.2 mg/l | TM099 | <0.2 # | | | | | |
| Sulphide | <0.01 mg/l | TM101 | <0.01 2 # | | | | | |
| Fluoride | <0.5 mg/l | TM104 | <0.5 # | | | | | |
| Conductivity @ 20 deg.C | <0.02 mS/cm | TM120 | 0.524 # | | | | | |
| Dissolved solids, Total (meter) | <5 mg/l | TM123 | 427 # | | | | | |
| Chromium, Trivalent | <0.03 mg/l | TM152 | <0.03 | | | | | |
| Antimony (diss.filt) | <1 µg/l | TM152 | <1 # | | | | | |
| Arsenic (diss.filt) | <0.5 µg/l | TM152 | <0.5 # | | | | | |
| Beryllium (diss.filt) | <0.1 µg/l | TM152 | <0.1 # | | | | | |
| Boron (diss.filt) | <10 µg/l | TM152 | 16.5 # | | | | | |
| Cadmium (diss.filt) | <0.08 µg/l | TM152 | <0.08 # | | | | | |
| Chromium (diss.filt) | <1 µg/l | TM152 | <1 # | | | | | |
| Copper (diss.filt) | <0.3 µg/l | TM152 | 1.54 # | | | | | |
| Lead (diss.filt) | <0.2 µg/l | TM152 | 0.456 # | | | | | |
| Manganese (diss.filt) | <3 µg/l | TM152 | <3 # | | | | | |
| Molybdenum (diss.filt) | <3 µg/l | TM152 | <3 # | | | | | |
| Nickel (diss.filt) | <0.4 µg/l | TM152 | 1.81 # | | | | | |
| Phosphorus (diss.filt) | <10 µg/l | TM152 | 10.3 # | | | | | |
| Selenium (diss.filt) | <1 µg/l | TM152 | <1 # | | | | | |
| Zinc (diss.filt) | <1 µg/l | TM152 | 83.4 # | | | | | |
| Sodium (Dis.Filt) | <0.076 mg/l | TM152 | 24.2 # | | | | | |
| Magnesium (Dis.Filt) | <0.036 mg/l | TM152 | 1.45 # | | | | | |
| Potassium (Dis.Filt) | <0.2 mg/l | TM152 | 0.692 # | | | | | |
| Calcium (Dis.Filt) | <0.2 mg/l | TM152 | 99.8 # | | | | | |
| Iron (Dis.Filt) | <0.019 mg/l | TM152 | <0.019 # | | | | | |
| Mercury (diss.filt) | <0.01 µg/l | TM183 | <0.01 # | | | | | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

**Results Legend**

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

| | | | |
|---|---|---|---|
| **Customer Sample Ref.** | W617 | | |
| **Depth (m)** | . | | |
| **Sample Type** | Ground Water (GW) | | |
| **Date Sampled** | 19/03/2021 | | |
| **Sampled Time** | 09:00:00 | | |
| **Date Received** | 20/03/2021 | | |
| **SDG Ref** | 210320-39 | | |
| **Lab Sample No.(s)** | 23941073 | | |
| **AGS Reference** | | | |

| Component | LOD/Units | Method | |
|---|---|---|---|
| Nitrite as NO2 | <0.05 mg/l | TM184 | <0.05 # |
| Phosphate (Ortho as PO4) | <0.05 mg/l | TM184 | <0.05 # |
| Sulphate | <2 mg/l | TM184 | 19.6 # |
| Chloride | <2 mg/l | TM184 | 38.1 # |
| Phosphate (Ortho as P) | <0.02 mg/l | TM184 | <0.02 # |
| Nitrate as NO3 | <0.3 mg/l | TM184 | 34 |
| Turbidity | <0.1 ntu | TM195 | 14.4 @ # |
| PCB congener 28 | <0.015 µg/l | TM197 | <0.015 |
| PCB congener 52 | <0.015 µg/l | TM197 | <0.015 |
| PCB congener 101 | <0.015 µg/l | TM197 | <0.015 |
| PCB congener 118 | <0.015 µg/l | TM197 | <0.015 |
| PCB congener 138 | <0.015 µg/l | TM197 | <0.015 |
| PCB congener 153 | <0.015 µg/l | TM197 | <0.015 |
| PCB congener 180 | <0.015 µg/l | TM197 | <0.015 |
| Sum of detected EC7 PCB's | <0.105 µg/l | TM197 | <0.105 |
| Cyanide, Total | <0.05 mg/l | TM227 | <0.05 @ # |
| Cyanide, Free | <0.05 mg/l | TM227 | <0.05 @ # |
| Chromium, Hexavalent | <0.03 mg/l | TM241 | <0.03 # |
| pH | <1 pH Units | TM256 | 7.78 # |
| Phenol | <0.002 mg/l | TM259 | <0.002 # |
| Cresols | <0.006 mg/l | TM259 | <0.006 # |
| Xylenols | <0.008 mg/l | TM259 | <0.008 # |
| Phenols, Total Detected monohydric | <0.016 mg/l | TM259 | <0.016 # |
| Trifluralin | <0.01 µg/l | TM343 | <0.01 |
| alpha-HCH | <0.01 µg/l | TM343 | <0.01 |
| gamma-HCH (Lindane) | <0.01 µg/l | TM343 | <0.01 |
| Heptachlor | <0.01 µg/l | TM343 | <0.01 |
| Aldrin | <0.01 µg/l | TM343 | <0.01 |
| beta-HCH | <0.01 µg/l | TM343 | <0.01 |
| Isodrin | <0.01 µg/l | TM343 | <0.01 |
| delta-HCH | <0.01 µg/l | TM343 | <0.01 |
| Heptachlor epoxide | <0.01 µg/l | TM343 | <0.01 |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

**Results Legend**

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

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Customer Sample Ref.** | W617 | | | | | | | |
| **Depth (m)** | . | | | | | | | |
| **Sample Type** | Ground Water (GW) | | | | | | | |
| **Date Sampled** | 19/03/2021 | | | | | | | |
| **Sampled Time** | 09:00:00 | | | | | | | |
| **Date Received** | 20/03/2021 | | | | | | | |
| **SDG Ref** | 210320-39 | | | | | | | |
| **Lab Sample No.(s)** | 23941073 | | | | | | | |
| **AGS Reference** | | | | | | | | |
| **Component** | **LOD/Units** | **Method** | | | | | | |
| o,p'-DDE | <0.01 µg/l | TM343 | <0.01 | | | | | |
| Endosulphan I | <0.01 µg/l | TM343 | <0.01 | | | | | |
| trans-Chlordane | <0.01 µg/l | TM343 | <0.01 | | | | | |
| cis-Chlordane | <0.01 µg/l | TM343 | <0.01 | | | | | |
| p,p'-DDE | <0.01 µg/l | TM343 | <0.01 | | | | | |
| Dieldrin | <0.01 µg/l | TM343 | <0.01 | | | | | |
| o,p'-DDD (TDE) | <0.01 µg/l | TM343 | <0.01 | | | | | |
| Endrin | <0.01 µg/l | TM343 | <0.01 | | | | | |
| o,p'-DDT | <0.01 µg/l | TM343 | <0.06 | | | | | |
| p,p'-DDD (TDE) | <0.01 µg/l | TM343 | <0.01 | | | | | |
| Endosulphan II | <0.02 µg/l | TM343 | <0.02 | | | | | |
| p,p'-DDT | <0.01 µg/l | TM343 | <0.06 | | | | | |
| o,p'-Methoxychlor | <0.01 µg/l | TM343 | <0.05 | | | | | |
| p,p'-Methoxychlor | <0.01 µg/l | TM343 | <0.1 | | | | | |
| Endosulphan Sulphate | <0.02 µg/l | TM343 | <0.04 | | | | | |
| Permethrin I | <0.01 µg/l | TM343 | <0.01 | | | | | |
| Permethrin II | <0.01 µg/l | TM343 | <0.01 | | | | | |
| 1,3,5-Trichlorobenzene | <0.01 µg/l | TM344 | <0.02 | | | | | |
| Hexachlorobutadiene | <0.01 µg/l | TM344 | <0.01 | | | | | |
| 1,2,4-Trichlorobenzene | <0.01 µg/l | TM344 | <0.01 | | | | | |
| 1,2,3-Trichlorobenzene | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Dichlorvos | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Dichlobenil | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Mevinphos | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Tecnazene | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Hexachlorobenzene | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Demeton-S-methyl | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Phorate | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Diazinon | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Triallate | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Atrazine | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Simazine | <0.01 µg/l | TM344 | <0.01 | | | | | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

**Results Legend**

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

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Customer Sample Ref.** | W617 | | | | | | | |
| **Depth (m)** | . | | | | | | | |
| **Sample Type** | Ground Water (GW) | | | | | | | |
| **Date Sampled** | 19/03/2021 | | | | | | | |
| **Sampled Time** | 09:00:00 | | | | | | | |
| **Date Received** | 20/03/2021 | | | | | | | |
| **SDG Ref** | 210320-39 | | | | | | | |
| **Lab Sample No.(s)** | 23941073 | | | | | | | |
| **AGS Reference** | | | | | | | | |
| **Component** | **LOD/Units** | **Method** | | | | | | |
| Disulfoton | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Propetamphos | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Chlorpyriphos-methyl | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Dimethoate | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Pirimiphos-methyl | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Chlorpyriphos | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Methyl Parathion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Malathion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Fenthion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Fenitrothion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Triadimefon | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Pendimethalin | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Parathion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Chlorfenvinphos | <0.01 µg/l | TM344 | <0.01 | | | | | |
| trans-Chlordane | <0.01 µg/l | TM344 | <0.01 | | | | | |
| cis-Chlordane | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Ethion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Carbophenothion | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Triazophos | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Phosalone | <0.01 µg/l | TM344 | <0.01 | | | | | |
| Azinphos methyl | <0.02 µg/l | TM344 | <0.02 | | | | | |
| Azinphos ethyl | <0.02 µg/l | TM344 | <0.02 | | | | | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## PAH Spec MS - Aqueous (W)

**Results Legend**

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

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Customer Sample Ref.** | W617 | | | | | | | |
| **Depth (m)** | . | | | | | | | |
| **Sample Type** | Ground Water (GW) | | | | | | | |
| **Date Sampled** | 19/03/2021 | | | | | | | |
| **Sampled Time** | 09:00:00 | | | | | | | |
| **Date Received** | 20/03/2021 | | | | | | | |
| **SDG Ref** | 210320-39 | | | | | | | |
| **Lab Sample No.(s)** | 23941073 | | | | | | | |
| **AGS Reference** | | | | | | | | |
| **Component** | **LOD/Units** | **Method** | | | | | | |
| Naphthalene (aq) | <0.01 µg/l | TM178 | <0.01 @ # | | | | | |
| Acenaphthene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Acenaphthylene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Fluoranthene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Anthracene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Phenanthrene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Fluorene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Chrysene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Pyrene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Benzo(a)anthracene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Benzo(b)fluoranthene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Benzo(k)fluoranthene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Benzo(a)pyrene (aq) | <0.002 µg/l | TM178 | <0.002 @ # | | | | | |
| Dibenzo(a,h)anthracene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Benzo(g,h,i)perylene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| Indeno(1,2,3-cd)pyrene (aq) | <0.005 µg/l | TM178 | <0.005 @ # | | | | | |
| PAH, Total Detected USEPA 16 (aq) | <0.082 µg/l | TM178 | <0.082 @ # | | | | | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## SVOC MS (W) - Aqueous

**Results Legend**

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

| Component | LOD/Units | Method | Customer Sample Ref. | Depth (m) | Sample Type | Date Sampled | Sampled Time | Date Received | SDG Ref | Lab Sample No.(s) | AGS Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | W617 | . | Ground Water (GW) | 19/03/2021 | 09:00:00 | 20/03/2021 | 210320-39 | 23941073 | |
| 1,2,4-Trichlorobenzene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 1,2-Dichlorobenzene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 1,3-Dichlorobenzene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 1,4-Dichlorobenzene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2,4,5-Trichlorophenol (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2,4,6-Trichlorophenol (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2,4-Dichlorophenol (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2,4-Dimethylphenol (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2,4-Dinitrotoluene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2,6-Dinitrotoluene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2-Chloronaphthalene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2-Chlorophenol (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2-Methylnaphthalene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2-Methylphenol (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2-Nitroaniline (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 2-Nitrophenol (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 3-Nitroaniline (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 4-Bromophenylphenylether (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 4-Chloro-3-methylphenol (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 4-Chloroaniline (aq) | <1 µg/l | TM176 | <1 | | | | | | | | |
| 4-Chlorophenylphenylether (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 4-Methylphenol (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 4-Nitroaniline (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| 4-Nitrophenol (aq) | <1 µg/l | TM176 | <1 | | | | | | | | |
| Azobenzene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| Acenaphthylene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| Acenaphthene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| Anthracene (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| bis(2-Chloroethyl)ether (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| bis(2-Chloroethoxy)methane (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |
| bis(2-Ethylhexyl) phthalate (aq) | <2 µg/l | TM176 | <2 @ # | | | | | | | | |
| Butylbenzyl phthalate (aq) | <1 µg/l | TM176 | <1 @ # | | | | | | | | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## SVOC MS (W) - Aqueous

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

| | |
|---|---|
| **Customer Sample Ref.** | W617 |
| **Depth (m)** | . |
| **Sample Type** | Ground Water (GW) |
| **Date Sampled** | 19/03/2021 |
| **Sampled Time** | 09:00:00 |
| **Date Received** | 20/03/2021 |
| **SDG Ref** | 210320-39 |
| **Lab Sample No.(s)** | 23941073 |
| **AGS Reference** | |

| Component | LOD/Units | Method | |
|---|---|---|---|
| Benzo(a)anthracene (aq) | <1 µg/l | TM176 | <1 @ # |
| Benzo(b)fluoranthene (aq) | <1 µg/l | TM176 | <1 @ # |
| Benzo(k)fluoranthene (aq) | <1 µg/l | TM176 | <1 @ # |
| Benzo(a)pyrene (aq) | <1 µg/l | TM176 | <1 @ # |
| Benzo(g,h,i)perylene (aq) | <1 µg/l | TM176 | <1 @ # |
| Carbazole (aq) | <1 µg/l | TM176 | <1 @ # |
| Chrysene (aq) | <1 µg/l | TM176 | <1 @ # |
| Dibenzofuran (aq) | <1 µg/l | TM176 | <1 @ # |
| n-Dibutyl phthalate (aq) | <1 µg/l | TM176 | <1 @ # |
| Diethyl phthalate (aq) | <1 µg/l | TM176 | <1 @ # |
| Dibenzo(a,h)anthracene (aq) | <1 µg/l | TM176 | <1 @ # |
| Dimethyl phthalate (aq) | <1 µg/l | TM176 | <1 @ # |
| n-Dioctyl phthalate (aq) | <5 µg/l | TM176 | <5 @ # |
| Fluoranthene (aq) | <1 µg/l | TM176 | <1 @ # |
| Fluorene (aq) | <1 µg/l | TM176 | <1 @ # |
| Hexachlorobenzene (aq) | <1 µg/l | TM176 | <1 @ # |
| Hexachlorobutadiene (aq) | <1 µg/l | TM176 | <1 @ # |
| Pentachlorophenol (aq) | <1 µg/l | TM176 | <1 |
| Phenol (aq) | <1 µg/l | TM176 | <1 |
| n-Nitroso-n-dipropylamine (aq) | <1 µg/l | TM176 | <1 @ # |
| Hexachloroethane (aq) | <1 µg/l | TM176 | <1 @ # |
| Nitrobenzene (aq) | <1 µg/l | TM176 | <1 @ # |
| Naphthalene (aq) | <1 µg/l | TM176 | <1 @ # |
| Isophorone (aq) | <1 µg/l | TM176 | <1 @ # |
| Hexachlorocyclopentadiene (aq) | <1 µg/l | TM176 | <1 |
| Phenanthrene (aq) | <1 µg/l | TM176 | <1 @ # |
| Indeno(1,2,3-cd)pyrene (aq) | <1 µg/l | TM176 | <1 @ # |
| Pyrene (aq) | <1 µg/l | TM176 | <1 @ # |
| SVOC TIC (aq) | | TM176 | Not Detected @ |
| Total SVOC TIC | <10 µg/l | TM176 | <10 |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## TPH CWG (W)

**Results Legend**

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

| Component | LOD/Units | Method | Customer Sample Ref. W617 | Depth (m) . | Sample Type Ground Water (GW) | Date Sampled 19/03/2021 | Sampled Time 09:00:00 | Date Received 20/03/2021 | SDG Ref 210320-39 | Lab Sample No.(s) 23941073 | AGS Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GRO Surrogate % recovery** | % | TM245 | 89 | | | | | | | 1 | |
| GRO >C5-C12 | <50 µg/l | TM245 | <50 | | | | | | | 1 # | |
| Methyl tertiary butyl ether (MTBE) | <3 µg/l | TM245 | <3 | | | | | | | 1 # | |
| Benzene | <7 µg/l | TM245 | <7 | | | | | | | 1 # | |
| Toluene | <4 µg/l | TM245 | <4 | | | | | | | 1 # | |
| Ethylbenzene | <5 µg/l | TM245 | <5 | | | | | | | 1 # | |
| m,p-Xylene | <8 µg/l | TM245 | <8 | | | | | | | 1 # | |
| o-Xylene | <3 µg/l | TM245 | <3 | | | | | | | 1 # | |
| Sum of detected Xylenes | <11 µg/l | TM245 | <11 | | | | | | | 1 | |
| Sum of detected BTEX | <28 µg/l | TM245 | <28 | | | | | | | 1 | |
| Aliphatics >C5-C6 | <10 µg/l | TM245 | <10 | | | | | | | 1 | |
| Aliphatics >C6-C8 | <10 µg/l | TM245 | <10 | | | | | | | 1 | |
| Aliphatics >C8-C10 | <10 µg/l | TM245 | <10 | | | | | | | 1 | |
| Aliphatics >C10-C12 | <10 µg/l | TM245 | <10 | | | | | | | 1 | |
| Aliphatics >C12-C16 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aliphatics >C16-C21 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aliphatics >C21-C35 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Total Aliphatics >C12-C35 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aromatics >EC5-EC7 | <10 µg/l | TM245 | <10 | | | | | | | 1 | |
| Aromatics >EC7-EC8 | <10 µg/l | TM245 | <10 | | | | | | | 1 | |
| Aromatics >EC8-EC10 | <10 µg/l | TM245 | <10 | | | | | | | 1 | |
| Aromatics >EC10-EC12 | <10 µg/l | TM245 | <10 | | | | | | | 1 | |
| Aromatics >EC12-EC16 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aromatics >EC16-EC21 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aromatics >EC21-EC35 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Total Aromatics >EC12-EC35 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Total Aliphatics & Aromatics >C5-35 (aq) | <10 µg/l | TM174 | <10 | | | | | | | | |
| Aliphatics >C16-C35 Aqueous | <10 µg/l | TM174 | <10 | | | | | | | | |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## VOC MS (W)

**Results Legend**

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

| | |
|---|---|
| **Customer Sample Ref.** | W617 |
| **Depth (m)** | . |
| **Sample Type** | Ground Water (GW) |
| **Date Sampled** | 19/03/2021 |
| **Sampled Time** | 09:00:00 |
| **Date Received** | 20/03/2021 |
| **SDG Ref** | 210320-39 |
| **Lab Sample No.(s)** | 23941073 |
| **AGS Reference** | |

| Component | LOD/Units | Method | |
|---|---|---|---|
| Dibromofluoromethane** | % | TM208 | 116 1 |
| Toluene-d8** | % | TM208 | 98.9 1 |
| 4-Bromofluorobenzene** | % | TM208 | 94.7 1 |
| Dichlorodifluoromethane | <1 µg/l | TM208 | <1 1 @ # |
| Chloromethane | <1 µg/l | TM208 | <1 1 # |
| Vinyl chloride | <1 µg/l | TM208 | <1 1 # |
| Bromomethane | <1 µg/l | TM208 | <1 1 # |
| Chloroethane | <1 µg/l | TM208 | <1 1 # |
| Trichlorofluoromethane | <1 µg/l | TM208 | <1 1 # |
| 1,1-Dichloroethene | <1 µg/l | TM208 | <1 1 # |
| Carbon disulphide | <1 µg/l | TM208 | <1 1 # |
| Dichloromethane | <3 µg/l | TM208 | <3 1 # |
| Methyl tertiary butyl ether (MTBE) | <1 µg/l | TM208 | <1 1 # |
| trans-1,2-Dichloroethene | <1 µg/l | TM208 | <1 1 # |
| 1,1-Dichloroethane | <1 µg/l | TM208 | <1 1 # |
| cis-1,2-Dichloroethene | <1 µg/l | TM208 | <1 1 # |
| 2,2-Dichloropropane | <1 µg/l | TM208 | <1 1 |
| Bromochloromethane | <1 µg/l | TM208 | <1 1 # |
| Chloroform | <1 µg/l | TM208 | <1 1 # |
| 1,1,1-Trichloroethane | <1 µg/l | TM208 | <1 1 # |
| 1,1-Dichloropropene | <1 µg/l | TM208 | <1 1 # |
| Carbontetrachloride | <1 µg/l | TM208 | <1 1 # |
| 1,2-Dichloroethane | <1 µg/l | TM208 | <1 1 # |
| Benzene | <1 µg/l | TM208 | <1 1 # |
| Trichloroethene | <1 µg/l | TM208 | <1 1 # |
| 1,2-Dichloropropane | <1 µg/l | TM208 | <1 1 # |
| Dibromomethane | <1 µg/l | TM208 | <1 1 # |
| Bromodichloromethane | <1 µg/l | TM208 | <1 1 # |
| cis-1,3-Dichloropropene | <1 µg/l | TM208 | <1 1 # |
| Toluene | <1 µg/l | TM208 | <1 1 # |
| trans-1,3-Dichloropropene | <1 µg/l | TM208 | <1 1 # |
| 1,1,2-Trichloroethane | <1 µg/l | TM208 | <1 1 # |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## VOC MS (W)

**Results Legend**

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

| | |
|---|---|
| **Customer Sample Ref.** | W617 |
| **Depth (m)** | . |
| **Sample Type** | Ground Water (GW) |
| **Date Sampled** | 19/03/2021 |
| **Sampled Time** | 09:00:00 |
| **Date Received** | 20/03/2021 |
| **SDG Ref** | 210320-39 |
| **Lab Sample No.(s)** | 23941073 |
| **AGS Reference** | |

| Component | LOD/Units | Method | |
|---|---|---|---|
| 1,3-Dichloropropane | <1 µg/l | TM208 | <1 1 # |
| Tetrachloroethene | <1 µg/l | TM208 | <1 1 # |
| Dibromochloromethane | <1 µg/l | TM208 | <1 1 # |
| 1,2-Dibromoethane | <1 µg/l | TM208 | <1 1 # |
| Chlorobenzene | <1 µg/l | TM208 | <1 1 # |
| 1,1,1,2-Tetrachloroethane | <1 µg/l | TM208 | <1 1 # |
| Ethylbenzene | <1 µg/l | TM208 | <1 1 # |
| m,p-Xylene | <1 µg/l | TM208 | <1 1 # |
| o-Xylene | <1 µg/l | TM208 | <1 1 # |
| Styrene | <1 µg/l | TM208 | <1 1 # |
| Bromoform | <1 µg/l | TM208 | <1 1 # |
| Isopropylbenzene | <1 µg/l | TM208 | <1 1 # |
| 1,1,2,2-Tetrachloroethane | <1 µg/l | TM208 | <1 1 # |
| 1,2,3-Trichloropropane | <1 µg/l | TM208 | <1 1 # |
| Bromobenzene | <1 µg/l | TM208 | <1 1 # |
| Propylbenzene | <1 µg/l | TM208 | <1 1 # |
| 2-Chlorotoluene | <1 µg/l | TM208 | <1 1 # |
| 1,3,5-Trimethylbenzene | <1 µg/l | TM208 | <1 1 # |
| 4-Chlorotoluene | <1 µg/l | TM208 | <1 1 # |
| tert-Butylbenzene | <1 µg/l | TM208 | <1 1 # |
| 1,2,4-Trimethylbenzene | <1 µg/l | TM208 | <1 1 # |
| sec-Butylbenzene | <1 µg/l | TM208 | <1 1 # |
| 4-iso-Propyltoluene | <1 µg/l | TM208 | <1 1 # |
| 1,3-Dichlorobenzene | <1 µg/l | TM208 | <1 1 # |
| 1,4-Dichlorobenzene | <1 µg/l | TM208 | <1 1 # |
| n-Butylbenzene | <1 µg/l | TM208 | <1 1 # |
| 1,2-Dichlorobenzene | <1 µg/l | TM208 | <1 1 # |
| 1,2-Dibromo-3-chloropropane | <1 µg/l | TM208 | <1 1 |
| 1,2,4-Trichlorobenzene | <1 µg/l | TM208 | <1 1 # |
| Hexachlorobutadiene | <1 µg/l | TM208 | <1 1 # |
| tert-Amyl methyl ether (TAME) | <1 µg/l | TM208 | <1 1 # |
| Naphthalene | <1 µg/l | TM208 | <1 1 # |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## VOC MS (W)

**Results Legend**

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

| Component | LOD/Units | Method | Customer Sample Ref. | |
|---|---|---|---|---|
| | | | Depth (m) | . |
| | | | Sample Type | Ground Water (GW) |
| | | | Date Sampled | 19/03/2021 |
| | | | Sampled Time | 09:00:00 |
| | | | Date Received | 20/03/2021 |
| | | | SDG Ref | 210320-39 |
| | | | Lab Sample No.(s) | 23941073 |
| | | | AGS Reference | |
| 1,2,3-Trichlorobenzene | <1 µg/l | TM208 | <1 | 1 # |
| 1,3,5-Trichlorobenzene | <1 µg/l | TM208 | <1 | 1 |
| VOC TIC | | TM208 | Not Detected | 1 |
| Sum of detected Xylenes | <2 µg/l | TM208 | <2 | 1 |
| Total VOC TIC | <10 µg/l | TM208 | <10 | 1 |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## Table of Results - Appendix

| Method No | Reference | Description |
|---|---|---|
| TM022 | Method 2540D, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part120 1981;BS EN 872 | Determination of total suspended solids in waters |
| TM043 | Method 2320B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part109 1984 | Determination of alkalinity in aqueous samples |
| TM046 | Method 4500G, AWWA/APHA, 20th Ed., 1999 | Measurement of Dissolved Oxygen by Oxygen Meter |
| TM090 | Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060 | Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water |
| TM099 | BS 2690: Part 7:1968 / BS 6068: Part2.11:1984 | Determination of Ammonium in Water Samples using the Kone Analyser |
| TM101 | Method 4500B & C, AWWA/APHA, 20th Ed., 1999 | Determination of Sulphide in soil and water samples using the Kone Analyser |
| TM104 | Method 4500F, AWWA/APHA, 20th Ed., 1999 | Determination of Fluoride using the Kone Analyser |
| TM120 | Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970 | Determination of Electrical Conductivity using a Conductivity Meter |
| TM123 | BS 2690: Part 121:1981 | The Determination of Total Dissolved Solids in Water |
| TM152 | Method 3125B, AWWA/APHA, 20th Ed., 1999 | Analysis of Aqueous Samples by ICP-MS |
| TM174 | Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria | Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID |
| TM176 | EPA 8270D Semi-Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) | Determination of SVOCs in Water by GCMS |
| TM178 | Modified: US EPA Method 8100 | Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters |
| TM183 | BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3 | Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry |
| TM184 | EPA Methods 325.1 & 325.2, | The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers |
| TM195 | Colour and Turbidity of water. Methods for the Examination of Waters and Associated Materials. HMSO, 1981, ISBN 0 11 751955 3. | Determination of Turbidity in Waters & Associated Matrices |
| TM197 | Modified: US EPA Method 8082.EA Method 174 and 5109631 | Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Waters |
| TM208 | Modified: US EPA Method 8260b & 624 | Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters |
| TM227 | Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500. | Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate |
| TM241 | Methods for the Examination of Waters and Associated Materials; Chromium in Raw and Potable Waters and Sewage Effluents 1980. | The Determination of Hexavalent Chromium in Waters and Leachates using the Kone Analyser |
| TM245 | By GC-FID | Determination of GRO by Headspace in waters |
| TM256 | The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4. | Determination of pH in Water and Leachate using the GLpH pH Meter |
| TM259 | by HPLC | Determination of Phenols in Waters and Leachates by HPLC |
| TM343 | EPA 8270D - Semi-Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) | Determination of Selected Pesticides (Suite I) in Liquids by GCMS |
| TM344 | EPA 8270D – Semi-Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) | Determination of selected pesticides (Suite II) by GCMS |

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

# Test Completion Dates

| | |
|---|---|
| **Lab Sample No(s)** | 23941073 |
| **Customer Sample Ref.** | W617 |
| **AGS Ref.** | |
| **Depth** | |
| **Type** | Ground Water |
| Alkalinity as CaCO3 | 01-Apr-2021 |
| Ammoniacal Nitrogen | 01-Apr-2021 |
| Anions by Kone (w) | 30-Mar-2021 |
| Chromium III | 31-Mar-2021 |
| Conductivity (at 20 deg.C) | 01-Apr-2021 |
| Cyanide Comp/Free/Total/Thiocyanate | 31-Mar-2021 |
| Dissolved Metals by ICP-MS | 31-Mar-2021 |
| Dissolved Organic/Inorganic Carbon | 07-Apr-2021 |
| Dissolved Oxygen by Probe | 21-Mar-2021 |
| EPH CWG (Aliphatic) Aqueous GC (W) | 08-Apr-2021 |
| EPH CWG (Aromatic) Aqueous GC (W) | 08-Apr-2021 |
| Fluoride | 30-Mar-2021 |
| GRO by GC-FID (W) | 01-Apr-2021 |
| Hexavalent Chromium (w) | 30-Mar-2021 |
| Mercury Dissolved | 01-Apr-2021 |
| Nitrite by Kone (w) | 30-Mar-2021 |
| PAH Spec MS - Aqueous (W) | 07-Apr-2021 |
| PCB Congeners - Aqueous (W) | 07-Apr-2021 |
| Pesticides (Suite I) by GCMS | 08-Apr-2021 |
| Pesticides (Suite II) by GCMS | 01-Apr-2021 |
| pH Value | 31-Mar-2021 |
| Phenols by HPLC (W) | 01-Apr-2021 |
| Phosphate by Kone (w) | 30-Mar-2021 |
| Sulphide | 23-Mar-2021 |
| Suspended Solids | 23-Mar-2021 |
| SVOC MS (W) - Aqueous | 07-Apr-2021 |
| Total Dissolved Solids | 06-Apr-2021 |
| TPH CWG (W) | 08-Apr-2021 |
| Turbidity in waters | 30-Mar-2021 |
| VOC MS (W) | 01-Apr-2021 |

# ASSOCIATED AQC DATA

## Alkalinity as CaCO3

| Component | Method Code | QC 2486 |
|---|---|---|
| Total Alkalinity as CaCO3 | TM043 | **98.99**<br>94.47 : 104.41 |

## Ammoniacal Nitrogen

| Component | Method Code | QC 2493 |
|---|---|---|
| Ammoniacal Nitrogen as N | TM099 | **98.8**<br>91.28 : 106.64 |

## Anions by Kone (w)

| Component | Method Code | QC 2346 |
|---|---|---|
| Chloride | TM184 | **102.0**<br>92.93 : 115.43 |
| Sulphate (soluble) | TM184 | **101.2**<br>90.53 : 113.03 |
| TON as NO3 | TM184 | **103.0**<br>99.60 : 111.90 |

## Conductivity (at 20 deg.C)

| Component | Method Code | QC 2450 |
|---|---|---|
| Conductivity (at 20 deg.C) | TM120 | **103.76**<br>100.75 : 105.26 |

## Cyanide Comp/Free/Total/Thiocyanate

| Component | Method Code | QC 2472 |
|---|---|---|
| Free Cyanide (W) | TM227 | **83.0**<br>91.52 : 123.82 |
| Thiocyanate (W) | TM227 | **100.0**<br>90.50 : 113.00 |
| Total Cyanide (W) | TM227 | **106.25**<br>91.75 : 112.75 |

## Dissolved Metals by ICP-MS

| Component | Method Code | QC 2468 |
|---|---|---|
| Aluminium | TM152 | **96.0**<br>90.78 : 110.89 |
| Antimony | TM152 | **96.5**<br>77.22 : 119.42 |
| Arsenic | TM152 | **94.83**<br>86.77 : 107.67 |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## Dissolved Metals by ICP-MS

| | | QC 2468 |
|---|---|---|
| Barium | TM152 | **94.67** 87.86 : 110.23 |
| Beryllium | TM152 | **98.67** 86.19 : 112.98 |
| Bismuth | TM152 | **97.33** 84.06 : 106.46 |
| Borate | TM152 | **96.3** 88.00 : 112.00 |
| Boron | TM152 | **96.67** 83.92 : 114.90 |
| Cadmium | TM152 | **95.0** 88.89 : 106.69 |
| Calcium | TM152 | **99.33** 80.24 : 117.95 |
| Chromium | TM152 | **97.17** 83.22 : 110.16 |
| Cobalt | TM152 | **96.0** 82.49 : 112.36 |
| Copper | TM152 | **96.5** 83.14 : 113.00 |
| Iron | TM152 | **97.33** 88.40 : 109.24 |
| Lead | TM152 | **95.83** 83.71 : 109.58 |
| Lithium | TM152 | **96.5** 84.50 : 114.28 |
| Magnesium | TM152 | **96.0** 87.56 : 114.57 |
| Manganese | TM152 | **98.67** 90.01 : 108.72 |
| Molybdenum | TM152 | **92.67** 85.53 : 107.42 |
| Nickel | TM152 | **96.83** 88.05 : 106.42 |
| Phosphorus | TM152 | **96.67** 82.76 : 107.72 |
| Potassium | TM152 | **96.0** 88.45 : 106.42 |
| Selenium | TM152 | **94.5** 85.61 : 111.03 |
| Silver | TM152 | **91.67** 88.48 : 110.48 |
| Sodium | TM152 | **95.33** 88.32 : 106.30 |
| Strontium | TM152 | **96.0** 83.77 : 107.87 |
| Tellurium | TM152 | **93.17** 82.83 : 104.73 |
| Thallium | TM152 | **91.83** 77.47 : 113.87 |
| Tin | TM152 | **96.17** 87.36 : 109.55 |
| Titanium | TM152 | **97.67** 87.29 : 108.31 |

## Dissolved Metals by ICP-MS

| | | QC 2468 |
|---|---|---|
| Tungsten | TM152 | **93.5**<br>68.27 : 122.97 |
| Uranium | TM152 | **96.33**<br>82.46 : 105.16 |
| Vanadium | TM152 | **99.83**<br>88.43 : 114.30 |
| Zinc | TM152 | **97.67**<br>85.57 : 114.31 |

## Dissolved Organic/Inorganic Carbon

| Component | Method Code | QC 2470 |
|---|---|---|
| Dissolved Inorganic Carbon | TM090 | **109.5**<br>93.58 : 112.28 |
| Dissolved Organic Carbon | TM090 | **103.5**<br>96.13 : 109.53 |

## EPH CWG (Aliphatic) Aqueous GC (W)

| Component | Method Code | QC 2466 |
|---|---|---|
| Total Aliphatics >C10-C40 | TM174 | **115.02**<br>68.59 : 134.82 |

## EPH CWG (Aromatic) Aqueous GC (W)

| Component | Method Code | QC 2446 |
|---|---|---|
| Total Aromatics >EC10-EC40 | TM174 | **110.49**<br>60.75 : 129.09 |

## Fluoride

| Component | Method Code | QC 2375 |
|---|---|---|
| Fluoride | TM104 | **102.67**<br>96.67 : 108.67 |

## GRO by GC-FID (W)

| Component | Method Code | QC 2459 |
|---|---|---|
| Benzene by GC | TM245 | **102.0**<br>79.13 : 118.84 |
| Ethylbenzene by GC | TM245 | **99.5**<br>79.54 : 115.99 |
| m & p Xylene by GC | TM245 | **98.5**<br>78.44 : 116.32 |

## GRO by GC-FID (W)

| | | QC 2459 |
|---|---|---|
| MTBE GC-FID | TM245 | **102.0**<br>81.43 : 120.09 |
| o Xylene by GC | TM245 | **101.0**<br>76.85 : 120.29 |
| QC | TM245 | **106.29**<br>71.58 : 131.01 |
| Toluene by GC | TM245 | **101.0**<br>79.00 : 121.96 |

## Hexavalent Chromium (w)

| Component | Method Code | QC 2393 |
|---|---|---|
| Hexavalent Chromium | TM241 | **99.8**<br>94.17 : 106.17 |

## Mercury Dissolved

| Component | Method Code | QC 2337 |
|---|---|---|
| Mercury Dissolved (CVAF) | TM183 | **98.0**<br>69.30 : 128.70 |

## PAH Spec MS - Aqueous (W)

| Component | Method Code | QC 2459 |
|---|---|---|
| Acenaphthene by GCMS | TM178 | **106.4**<br>90.45 : 118.63 |
| Acenaphthylene by GCMS | TM178 | **106.0**<br>90.13 : 116.27 |
| Anthracene by GCMS | TM178 | **107.6**<br>92.40 : 114.00 |
| Benz(a)anthracene by GCMS | TM178 | **100.8**<br>89.51 : 117.69 |
| Benzo(a)pyrene by GCMS | TM178 | **101.6**<br>89.43 : 118.57 |
| Benzo(b)fluoranthene by GCMS | TM178 | **99.2**<br>87.80 : 121.80 |
| Benzo(ghi)perylene by GCMS | TM178 | **106.8**<br>87.10 : 119.30 |
| Benzo(k)fluoranthene by GCMS | TM178 | **101.2**<br>93.23 : 123.57 |
| Chrysene by GCMS | TM178 | **102.8**<br>88.68 : 116.92 |
| Dibenzo(ah)anthracene by GCMS | TM178 | **99.2**<br>86.24 : 118.56 |
| Fluoranthene by GCMS | TM178 | **110.0**<br>86.04 : 121.96 |
| Fluorene by GCMS | TM178 | **107.6**<br>90.76 : 121.24 |

## PAH Spec MS - Aqueous (W)

| | | QC 2459 |
|---|---|---|
| Indeno(123cd)pyrene by GCMS | TM178 | **102.4** 88.39 : 119.61 |
| Naphthalene by GCMS | TM178 | **107.6** 89.40 : 121.80 |
| Phenanthrene by GCMS | TM178 | **105.2** 90.41 : 119.19 |
| Pyrene by GCMS | TM178 | **108.4** 91.00 : 120.20 |

## PCB Congeners - Aqueous (W)

| Component | Method Code | QC 2467 |
|---|---|---|
| PCB congener 101 | TM197 | **112.8** 85.28 : 119.60 |
| PCB congener 105 | TM197 | **103.2** 81.16 : 119.80 |
| PCB congener 114 | TM197 | **102.4** 88.32 : 118.08 |
| PCB congener 118 | TM197 | **108.8** 87.76 : 117.04 |
| PCB congener 123 | TM197 | **96.8** 86.80 : 117.28 |
| PCB congener 126 | TM197 | **97.6** 84.56 : 116.00 |
| PCB congener 138 | TM197 | **99.2** 83.00 : 117.80 |
| PCB congener 153 | TM197 | **105.6** 84.12 : 117.00 |
| PCB congener 156 | TM197 | **99.2** 82.24 : 119.20 |
| PCB congener 157 | TM197 | **107.2** 84.96 : 116.40 |
| PCB congener 167 | TM197 | **103.2** 81.64 : 119.32 |
| PCB congener 169 | TM197 | **100.0** 84.60 : 117.96 |
| PCB congener 180 | TM197 | **106.8** 80.40 : 119.04 |
| PCB congener 189 | TM197 | **100.0** 81.56 : 119.00 |
| PCB congener 28 | TM197 | **110.0** 83.20 : 117.04 |
| PCB congener 52 | TM197 | **104.4** 81.84 : 119.52 |
| PCB congener 77 | TM197 | **99.2** 81.96 : 117.24 |
| PCB congener 81 | TM197 | **102.4** 82.28 : 120.20 |

## Pesticides (Suite I) by GCMS

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## Pesticides (Suite I) by GCMS

| Component | Method Code | QC 2331 |
|---|---|---|
| Aldrin - (Inst.) | TM343 | **82.92** 59.75 : 143.00 |
| alpha-HCH - (Inst.) | TM343 | **78.74** 75.13 : 166.63 |
| beta-HCH - (Inst.) | TM343 | **96.16** 85.48 : 166.48 |
| cis-Chlordane - (Inst.) | TM343 | **75.86** 71.70 : 156.00 |
| delta-HCH - (Inst.) | TM343 | **76.89** 83.98 : 156.58 |
| Dieldrin - (Inst.) | TM343 | **80.92** 77.45 : 154.10 |
| Endosulphan I - (Inst.) | TM343 | **75.39** 91.30 : 168.70 |
| Endosulphan II - (Inst.) | TM343 | **78.56** 82.68 : 161.13 |
| Endosulphan Sulphate - (Inst.) | TM343 | **75.45** 69.65 : 165.95 |
| Endrin - (Inst.) | TM343 | **99.57** 81.33 : 178.68 |
| gamma-HCH (Lindane) - (Inst.) | TM343 | **78.37** 83.15 : 175.40 |
| Heptachlor - (Inst.) | TM343 | **107.12** 63.65 : 167.80 |
| Heptachlor epoxide - (Inst.) | TM343 | **79.58** 73.28 : 159.38 |
| Isodrin - (Inst.) | TM343 | **80.51** 58.34 : 153.81 |
| o,p-DDD (TDE) - (Inst.) | TM343 | **78.37** 66.93 : 162.03 |
| o,p-DDE - (Inst.) | TM343 | **74.0** 64.68 : 156.78 |
| o,p-DDT - (Inst.) | TM343 | **86.95** 72.20 : 170.15 |
| o,p-Methoxychlor - (Inst.) | TM343 | **91.51** 73.33 : 171.13 |
| p,p-DDD (TDE) - (Inst.) | TM343 | **80.47** 67.95 : 160.20 |
| p,p-DDE - (Inst.) | TM343 | **74.83** 67.80 : 159.45 |
| p,p-DDT - (Inst.) | TM343 | **95.62** 68.30 : 178.25 |
| p,p-Methoxychlor - (Inst.) | TM343 | **99.86** 66.94 : 176.47 |
| Permethrin I - (Inst.) | TM343 | **82.02** 63.25 : 146.35 |
| Permethrin II - (Inst.) | TM343 | **81.68** 66.00 : 151.80 |
| trans-Chlordane - (Inst.) | TM343 | **78.76** 71.68 : 165.88 |
| Trifluralin - (Inst.) | TM343 | **116.98** 64.73 : 161.48 |

## pH Value

| Component | Method Code | QC 2485 |
|---|---|---|
| pH | TM256 | **101.74**<br>99.33 : 102.54 |

## Phenols by HPLC (W)

| Component | Method Code | QC 2436 |
|---|---|---|
| 2.3.5 Trimethyl-Phenol by HPLC (W) | TM259 | **50.0**<br>77.41 : 127.55 |
| 2-Isopropyl Phenol by HPLC (W) | TM259 | **49.0**<br>82.77 : 126.51 |
| Cresols by HPLC (W) | TM259 | **49.33**<br>76.60 : 126.28 |
| Napthol by HPLC (W) | TM259 | **49.0**<br>75.40 : 129.40 |
| Phenol by HPLC (W) | TM259 | **50.0**<br>85.77 : 125.91 |
| Xylenols by HPLC (W) | TM259 | **49.67**<br>79.09 : 131.82 |

## Phosphate by Kone (w)

| Component | Method Code | QC 2381 |
|---|---|---|
| Phosphate (Ortho as PO4) | TM184 | **102.0**<br>96.40 : 109.60 |

## Sulphide

| Component | Method Code | QC 2326 |
|---|---|---|
| Sulphide | TM101 | **101.33**<br>88.90 : 112.50 |

## Suspended Solids

| Component | Method Code | QC 2340 |
|---|---|---|
| Total Suspended Solids | TM022 | **98.14**<br>96.27 : 102.13 |

## SVOC MS (W) - Aqueous

## SVOC MS (W) - Aqueous

| Component | Method Code | QC 2445 |
|---|---|---|
| 4-Bromophenylphenylether | TM176 | **83.2** 61.60 : 106.72 |
| Benzo(a)anthracene | TM176 | **78.96** 64.64 : 115.52 |
| Benzo(a)pyrene | TM176 | **78.24** 60.56 : 115.28 |
| Butylbenzyl phthalate | TM176 | **81.6** 57.12 : 116.16 |
| Hexachlorobutadiene | TM176 | **78.16** 52.88 : 95.12 |
| Naphthalene | TM176 | **84.8** 65.68 : 110.32 |
| Nitrobenzene | TM176 | **75.2** 57.12 : 109.44 |
| Phenol | TM176 | **44.56** 37.60 : 70.72 |

## Total Dissolved Solids

| Component | Method Code | QC 2498 |
|---|---|---|
| Total Dissolved Solids | TM123 | **99.9** 97.30 : 100.92 |

## Turbidity in waters

| Component | Method Code | QC 2384 |
|---|---|---|
| Turbidity | TM195 | **100.75** 83.75 : 121.25 |

## VOC MS (W)

| Component | Method Code | QC 2479 |
|---|---|---|
| 1,1,1,2-Tetrachloroethane | TM208 | **100.0** 79.47 : 113.27 |
| 1,1,1-Trichloroethane | TM208 | **96.0** 81.01 : 112.00 |
| 1,1-Dichloroethane | TM208 | **96.0** 82.09 : 116.41 |
| 1,2-Dichloroethane | TM208 | **99.5** 80.28 : 123.63 |
| 2-Chlorotoluene | TM208 | **98.0** 83.31 : 110.91 |
| 4-Chlorotoluene | TM208 | **100.0** 84.01 : 111.46 |
| Benzene | TM208 | **98.5** 87.46 : 118.30 |
| Bromomethane | TM208 | **92.0** 76.99 : 118.39 |

## VOC MS (W)

| | | QC 2479 |
|---|---|---|
| Carbontetrachloride | TM208 | **100.5** 81.73 : 114.22 |
| Chlorobenzene | TM208 | **102.5** 90.24 : 109.71 |
| Chloroform | TM208 | **98.0** 83.67 : 118.08 |
| Chloromethane | TM208 | **86.0** 70.42 : 127.06 |
| Cis-1,2-Dichloroethene | TM208 | **96.5** 83.95 : 112.60 |
| Dichloromethane | TM208 | **96.5** 81.65 : 120.83 |
| Ethylbenzene | TM208 | **95.5** 85.59 : 106.44 |
| Hexachlorobutadiene | TM208 | **93.0** 66.83 : 108.27 |
| o-Xylene | TM208 | **97.5** 78.40 : 110.68 |
| p/m-Xylene | TM208 | **97.0** 82.64 : 112.12 |
| Tert-butyl methyl ether | TM208 | **82.5** 68.23 : 127.69 |
| Tetrachloroethene | TM208 | **104.5** 81.10 : 112.63 |
| Toluene | TM208 | **100.5** 87.40 : 109.78 |
| Trichloroethene | TM208 | **98.5** 81.17 : 111.80 |
| Vinyl Chloride | TM208 | **84.0** 72.73 : 123.40 |

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.
The figure detailed is the percentage recovery result for the AQC.
The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

# CERTIFICATE OF ANALYSIS

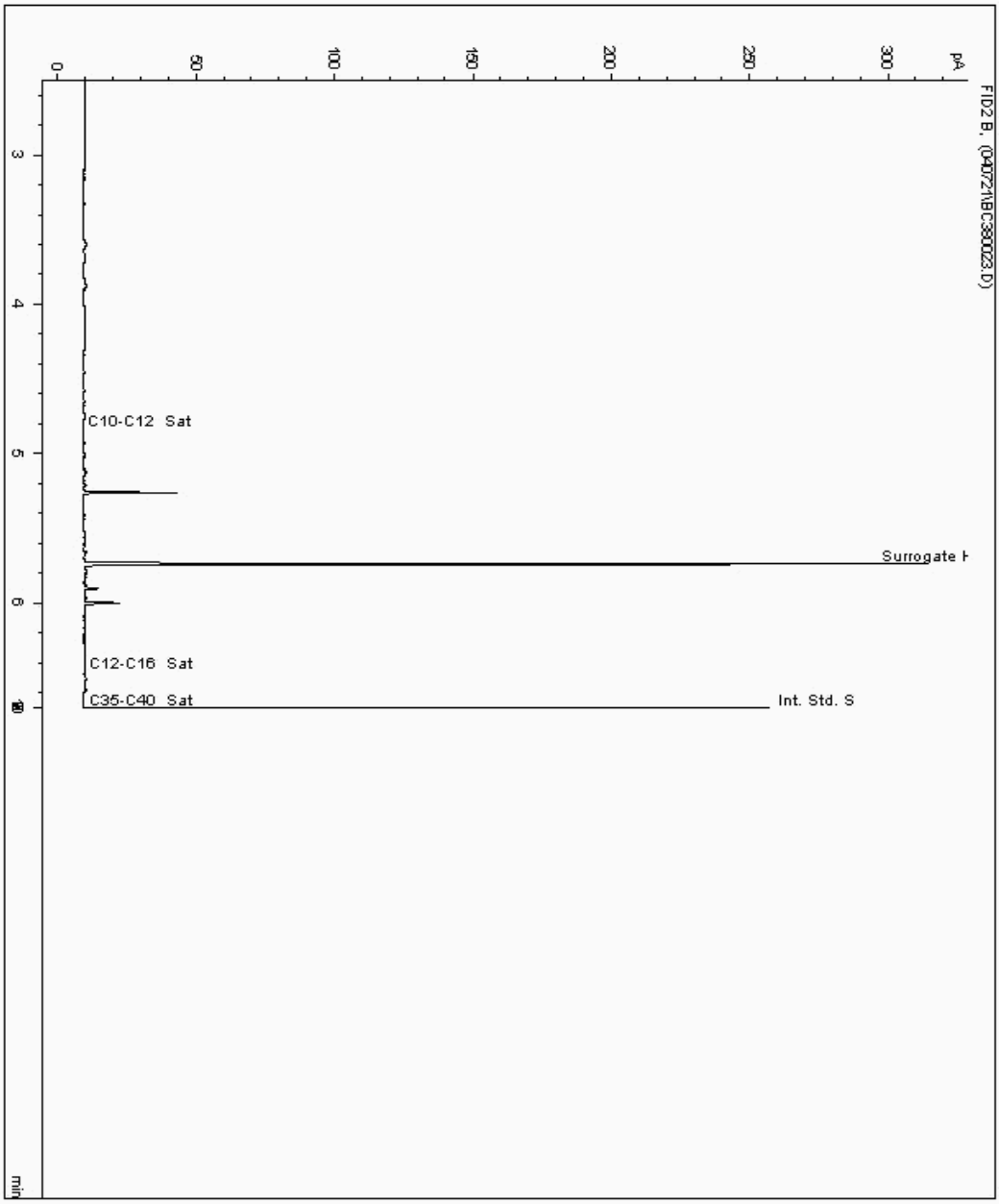
| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## Chromatogram

**Analysis:** EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 23993785 **Sample ID :** W617 **Depth :**

Speciated TPH - SATS ( C12 - C40 )

Sample Identity: 22486994-
Date Acquired : 08/04/21 05:37:16 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.026



# CERTIFICATE OF ANALYSIS

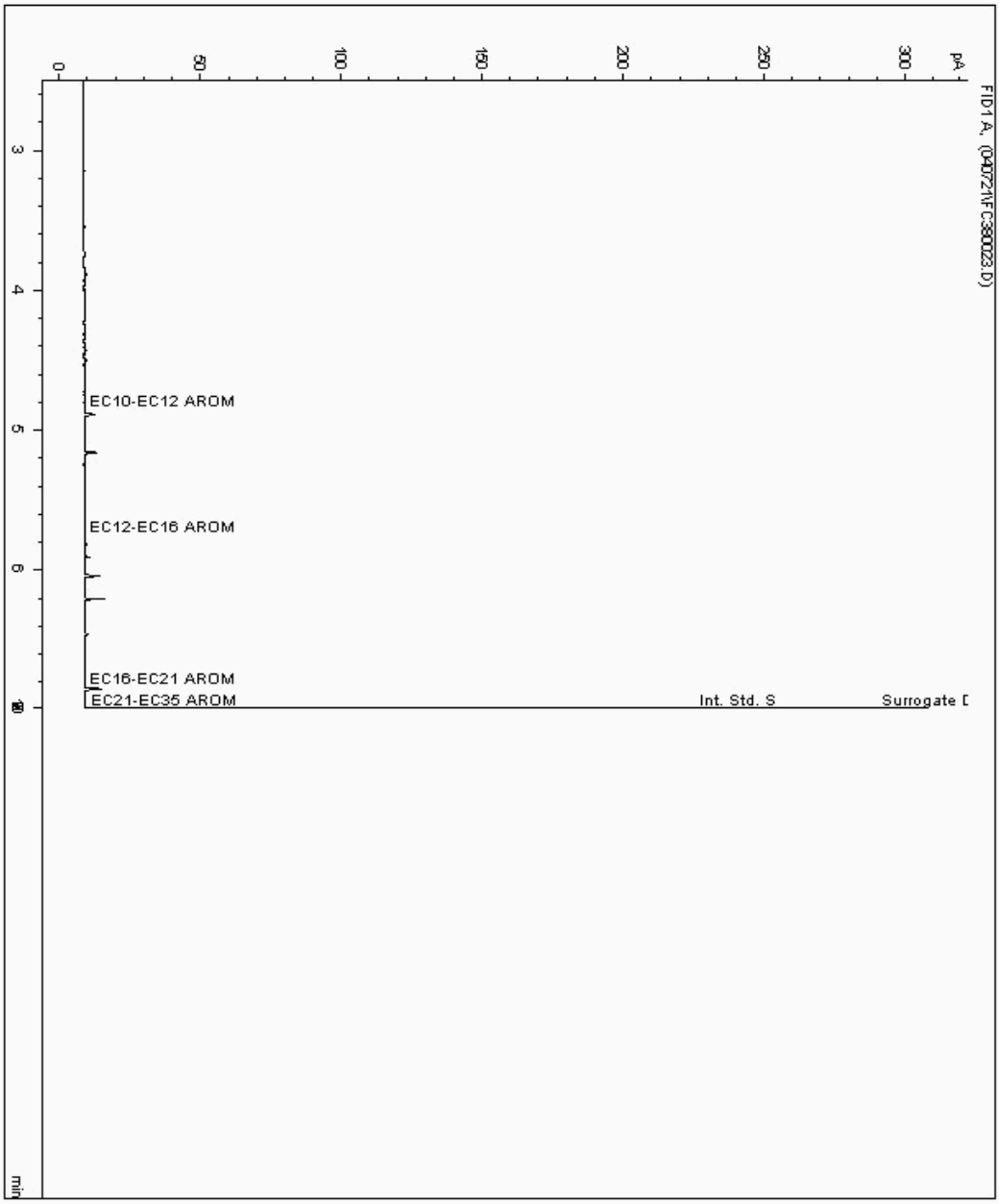
| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## Chromatogram

**Analysis:** EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 23993785 **Depth :**
**Sample ID :** W617

Speciated TPH - AROM ( C12 - C40 )

Sample Identity: 22486995-
Date Acquired : 08/04/21 05:37:16 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.026



# CERTIFICATE OF ANALYSIS

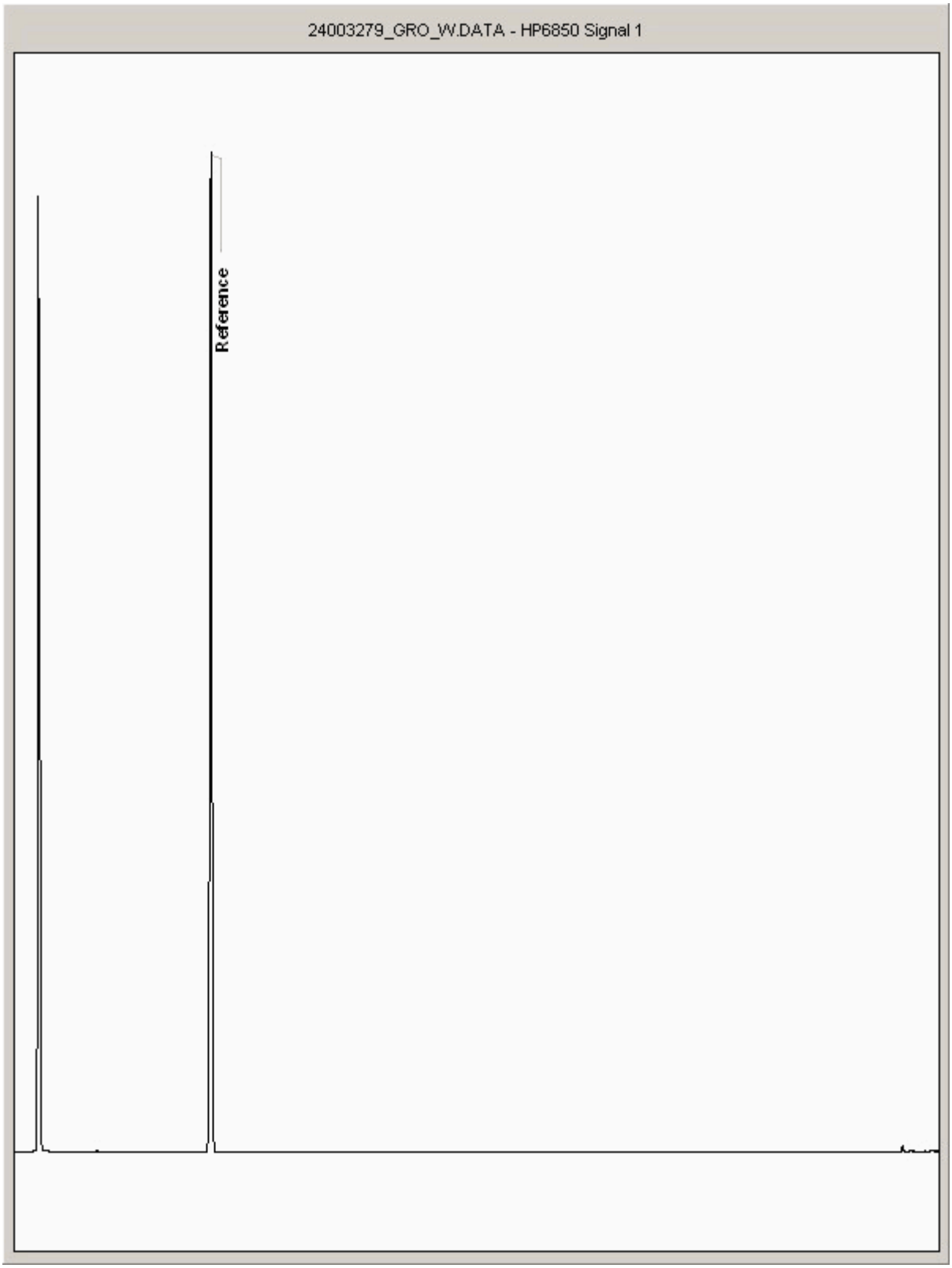
| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210320-39 | **Client Reference:** | JFR1451 | **Report Number:** | 593368 |
| **Location:** | A303 Stonehenge | **Order Number:** | PO21-326 | **Superseded Report:** | 591829 |

## Chromatogram

**Analysis:** GRO by GC-FID (W)

**Sample No :** 24003279
**Sample ID :** W617

**Depth :**



# Appendix General

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

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

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

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

7. Results relate only to the items tested.

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

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

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

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

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

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

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

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

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

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

18. **Sample Deviations**

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

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

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

**Identification of Asbestos in Bulk Materials & Soils**

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

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

**Visual Estimation Of Fibre Content**

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

**Respirable Fibres**

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

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

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

**Appendix 13: SmartTROLL Calbration Report 16/03/21**

# Calibration Report

| | |
|---|---|
| Instrument | SmarTROLL MP |
| Serial Number | 479040 |
| Created | 16/03/2021 |

## Sensor **RDO**

| | |
|---|---|
| Serial Number | 732173 |
| Last Calibrated | 11/02/2021 |

*Calibration Details*

| | |
|---|---|
| Slope | 1.014273 |
| Offset | -0.05 mg/L |

*Calibration point 100%*

| | |
|---|---|
| Concentration | 10.53 mg/L |
| Temperature | 12.48 °C |
| Barometric Pressure | 1,010.4 mbar |

*Calibration point 0%*

| | |
|---|---|
| Concentration | 0.05 mg/L |
| Temperature | 12.30 °C |

## Sensor **Conductivity**

| | |
|---|---|
| Serial Number | 479040 |
| Last Calibrated | 15/03/2021 |

*Calibration Details*

| | |
|---|---|
| Cell Constant | 1.001 |
| Reference Temperature | 25.00 °C |
| TDS Conversion Factor (ppm) | 0.65 |

## Sensor **Level**

| | |
|---|---|
| Serial Number | 457172 |
| Last Calibrated | 11/02/2021 |

*Calibration Details*

| | |
|---|---|
| Zero Offset | -0.18 psi |
| Reference Depth | 0.00 ft |
| Reference Offset | 0.00 psi |

| Sensor | **pH** |
|---|---|
| Serial Number | 19912 |
| Last Calibrated | 15/03/2021 |

*Calibration Details*

| | |
|---|---|
| Total Calibration Points | 1 |

*Calibration Point 1*

| | |
|---|---|
| pH of Buffer | 4.00 pH |
| pH mV | 86.9 mV |
| Temperature | 11.93 °C |

*Slope and Offset 1*

| | |
|---|---|
| Slope | -56.57 mV/pH |
| Offset | -82.8 mV |

| Sensor | **ORP** |
|---|---|
| Serial Number | 19912 |
| Last Calibrated | 15/03/2021 |

*Calibration Details*

| | |
|---|---|
| ORP Solution | ZoBell's |
| Offset | 65.3 mV |
| Temperature | 11.66 °C |

**Appendix 14: SmartTROLL Calbration Report 17/03/21**

# Calibration Report

| | |
|---|---|
| Instrument | SmarTROLL MP |
| Serial Number | 479040 |
| Created | 17/03/2021 |

## Sensor **RDO**

| | |
|---|---|
| Serial Number | 732173 |
| Last Calibrated | 11/02/2021 |

*Calibration Details*

| | |
|---|---|
| Slope | 1.014273 |
| Offset | -0.05 mg/L |

*Calibration point 100%*

| | |
|---|---|
| Concentration | 10.53 mg/L |
| Temperature | 12.48 °C |
| Barometric Pressure | 1,010.4 mbar |

*Calibration point 0%*

| | |
|---|---|
| Concentration | 0.05 mg/L |
| Temperature | 12.30 °C |

## Sensor **Conductivity**

| | |
|---|---|
| Serial Number | 479040 |
| Last Calibrated | 17/03/2021 |

*Calibration Details*

| | |
|---|---|
| Cell Constant | 0.927 |
| Reference Temperature | 25.00 °C |
| TDS Conversion Factor (ppm) | 0.65 |

## Sensor **Level**

| | |
|---|---|
| Serial Number | 457172 |
| Last Calibrated | 11/02/2021 |

*Calibration Details*

| | |
|---|---|
| Zero Offset | -0.18 psi |
| Reference Depth | 0.00 ft |
| Reference Offset | 0.00 psi |

| Sensor | **pH** |
|---|---|
| Serial Number | 19912 |
| Last Calibrated | 17/03/2021 |

*Calibration Details*

| | |
|---|---|
| Total Calibration Points | 2 |

*Calibration Point 1*

| | |
|---|---|
| pH of Buffer | 4.00 pH |
| pH mV | 78.6 mV |
| Temperature | 7.75 °C |

*Calibration Point 2*

| | |
|---|---|
| pH of Buffer | 7.06 pH |
| pH mV | -84.0 mV |
| Temperature | 7.78 °C |

*Slope and Offset 1*

| | |
|---|---|
| Slope | -53.15 mV/pH |
| Offset | -80.8 mV |

| Sensor | **ORP** |
|---|---|
| Serial Number | 19912 |
| Last Calibrated | 15/03/2021 |

*Calibration Details*

| | |
|---|---|
| ORP Solution | ZoBell's |
| Offset | 65.3 mV |
| Temperature | 11.66 °C |

**Appendix 15: SmartTROLL Calbration Report 18/03/21**

# Calibration Report

| | |
|---|---|
| Instrument | SmarTROLL MP |
| Serial Number | 479040 |
| Created | 18/03/2021 |

## Sensor **RDO**

| | |
|---|---|
| Serial Number | 732173 |
| Last Calibrated | 11/02/2021 |

*Calibration Details*

| | |
|---|---|
| Slope | 1.014273 |
| Offset | -0.05 mg/L |

*Calibration point 100%*

| | |
|---|---|
| Concentration | 10.53 mg/L |
| Temperature | 12.48 °C |
| Barometric Pressure | 1,010.4 mbar |

*Calibration point 0%*

| | |
|---|---|
| Concentration | 0.05 mg/L |
| Temperature | 12.30 °C |

## Sensor **Conductivity**

| | |
|---|---|
| Serial Number | 479040 |
| Last Calibrated | 18/03/2021 |

*Calibration Details*

| | |
|---|---|
| Cell Constant | 0.989 |
| Reference Temperature | 25.00 °C |
| TDS Conversion Factor (ppm) | 0.65 |

## Sensor **Level**

| | |
|---|---|
| Serial Number | 457172 |
| Last Calibrated | 11/02/2021 |

*Calibration Details*

| | |
|---|---|
| Zero Offset | -0.18 psi |
| Reference Depth | 0.00 ft |
| Reference Offset | 0.00 psi |

| Sensor | **pH** |
|---|---|
| Serial Number | 19912 |
| Last Calibrated | 18/03/2021 |

*Calibration Details*

| | |
|---|---|
| Total Calibration Points | 2 |

*Calibration Point 1*

| | |
|---|---|
| pH of Buffer | 4.00 pH |
| pH mV | 95.2 mV |
| Temperature | 21.10 °C |

*Calibration Point 2*

| | |
|---|---|
| pH of Buffer | 7.00 pH |
| pH mV | -75.5 mV |
| Temperature | 22.93 °C |

*Slope and Offset 1*

| | |
|---|---|
| Slope | -56.9 mV/pH |
| Offset | -75.5 mV |

| Sensor | **ORP** |
|---|---|
| Serial Number | 19912 |
| Last Calibrated | 15/03/2021 |

*Calibration Details*

| | |
|---|---|
| ORP Solution | ZoBell's |
| Offset | 65.3 mV |
| Temperature | 11.66 °C |

**Appendix 16: SmartTROLL Calbration Report 19/03/21**

# Calibration Report

| | |
|---|---|
| Instrument | SmarTROLL MP |
| Serial Number | 479040 |
| Created | 19/03/2021 |

## Sensor **RDO**

| | |
|---|---|
| Serial Number | 732173 |
| Last Calibrated | 11/02/2021 |

*Calibration Details*

| | |
|---|---|
| Slope | 1.014273 |
| Offset | -0.05 mg/L |

*Calibration point 100%*

| | |
|---|---|
| Concentration | 10.53 mg/L |
| Temperature | 12.48 °C |
| Barometric Pressure | 1,010.4 mbar |

*Calibration point 0%*

| | |
|---|---|
| Concentration | 0.05 mg/L |
| Temperature | 12.30 °C |

## Sensor **Conductivity**

| | |
|---|---|
| Serial Number | 479040 |
| Last Calibrated | 19/03/2021 |

*Calibration Details*

| | |
|---|---|
| Cell Constant | 0.978 |
| Reference Temperature | 25.00 °C |
| TDS Conversion Factor (ppm) | 0.65 |

## Sensor **Level**

| | |
|---|---|
| Serial Number | 457172 |
| Last Calibrated | 11/02/2021 |

*Calibration Details*

| | |
|---|---|
| Zero Offset | -0.18 psi |
| Reference Depth | 0.00 ft |
| Reference Offset | 0.00 psi |

| Sensor | **pH** |
|---|---|
| Serial Number | 19912 |
| Last Calibrated | 19/03/2021 |

*Calibration Details*

| | |
|---|---|
| Total Calibration Points | 2 |

*Calibration Point 1*

| | |
|---|---|
| pH of Buffer | 4.00 pH |
| pH mV | 89.3 mV |
| Temperature | 14.12 °C |

*Calibration Point 2*

| | |
|---|---|
| pH of Buffer | 7.02 pH |
| pH mV | -76.7 mV |
| Temperature | 17.41 °C |

*Slope and Offset 1*

| | |
|---|---|
| Slope | -54.95 mV/pH |
| Offset | -75.6 mV |

| Sensor | **ORP** |
|---|---|
| Serial Number | 19912 |
| Last Calibrated | 15/03/2021 |

*Calibration Details*

| | |
|---|---|
| ORP Solution | ZoBell's |
| Offset | 65.3 mV |
| Temperature | 11.66 °C |

**Appendix 17: Levelogger Calibration Reports**

# Solinst Levelogger Edge Calibration Report

Instrument:

| | |
|---|---|
| Manufacturer: | Solinst Canada |
| Product: | 3001 Levelogger Edge LT |
| Model Number: | M100 |
| Serial Number: | 2092507 |
| Pressure Range: | 0-100 m H20 |
| Resolution: | 0.6 mm H20 |
| Temperature Range: | -20 - +80 °C |
| Temperature Resolution: | 0.003 °C |

Method of Calibration:

The Levelogger is calibrated against a range of set reference points, with units of pressure in pounds per square inch. The conversion factor for pounds per square inch relates to pressure in bars and meters of water column is as follows: 1 pound per square inch = 0.0689476 bar = 0.703070 m H20 @ 4°C.

During the calibration procedure, the Levelogger is fully submerged in a highly accurate water bath, set to 6°C. The pressure is then calibrated to six separate pressure points covering the entire range for that particular Levelogger, to check for any non-linearity. This process is repeated at 18°C and then 36°C to check for temperature effects. The Levelogger is approved after all specifications for accuracy, precision, stability and hysteresis have been met.

Traceability:

Pressure standard: ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, NIST
Temperature standard: ISO/IEC 17025:2005, NVLAP LAB CODE: 200348-0

Uncertainty:

The standard deviation of the temperature was calculated from the contributions of uncertainties originating from the measurement standard, the bath homogeneity, and from any short term contribution from the instrument being calibrated. The standard deviation of the pressure was calculated from the contributions of the uncertainties originating from the measurement standard, any short term contribution from the instrument, and the uncertainty resulting from the uncertainty in temperature compensation. The reported uncertainty is stated as the standard deviation mutliplied by a factor of two.



**For further information, please contact: Solinst Canada Ltd.**
35 Todd Road, Georgetown, Ontario, Canada L7G 4R8 E-mail: instruments@solinst.com
Fax: +1 (905) 873-1992; (800) 516-9081 Tel: +1 (905) 873-2255; (800) 661-2023 Web Site: www.solinst.com

Serial Number: 2092507 Model Number: M100

**Test Results:**

Calibration Date: 7/26/2018

**Pressure Tests**

| Pressure | Reading (6 °C) | Level | Reading | Error (%FS) |
|---|---|---|---|---|
| 15.5 psi | 15.4930 psi | 1.3981 m | 1.3931 m | 0.004% |
| 45.5 psi | 45.4913 psi | 22.5086 m | 22.5025 m | 0.005% |
| 75.5 psi | 75.5124 psi | 43.6191 m | 43.6278 m | -0.007% |
| 105.5 psi | 105.5104 psi | 64.7297 m | 64.7370 m | -0.006% |
| 135.5 psi | 135.4883 psi | 85.8402 m | 85.8319 m | 0.007% |
| 165.5 psi | 165.5087 psi | 106.9507 m | 106.9568 m | -0.005% |

Hysteresis: 0.0025%
Standard Deviation: 0.0066%

**Temperature Tests**

| Temperature | Reading | Error (%FS) |
|---|---|---|
| 6 °C | 6.0000 °C | 0.000% |
| 18 °C | 17.9997 °C | 0.000% |
| 36 °C | 35.9996 °C | 0.000% |

Standard Deviation: 0.0002%

**Conclusion: This instrument fulfils the specifications**

Uncertainty temperature standard: 0.003 °C
Overall uncertainty temperature: ±1.002
Uncertainty pressure standard: <0.003%
Overall uncertainty pressure: 0.01%

Calibration Manager: [redacted]



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Solinst®

# Solinst Levelogger Edge Calibration Report

Instrument:

| | |
|---|---|
| Manufacturer: | Solinst Canada |
| Product: | 3001 Levelogger Edge LT |
| Model Number: | M100 |
| Serial Number: | 2090963 |
| Pressure Range: | 0-100 m H20 |
| Resolution: | 0.6 mm H20 |
| Temperature Range: | -20 - +80 °C |
| Temperature Resolution: | 0.003 °C |

Method of Calibration:

The Levelogger is calibrated against a range of set reference points, with units of pressure in pounds per square inch. The conversion factor for pounds per square inch relates to pressure in bars and meters of water column is as follows: 1 pound per square inch = 0.0689476 bar = 0.703070 m H20 @ 4°C.

During the calibration procedure, the Levelogger is fully submerged in a highly accurate water bath, set to 6°C. The pressure is then calibrated to six separate pressure points covering the entire range for that particular Levelogger, to check for any non-linearity. This process is repeated at 18°C and then 36°C to check for temperature effects. The Levelogger is approved after all specifications for accuracy, precision, stability and hysteresis have been met.

Traceability:

Pressure standard: ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, NIST
Temperature standard: ISO/IEC 17025:2005, NVLAP LAB CODE: 200348-0

Uncertainty:

The standard deviation of the temperature was calculated from the contributions of uncertainties originating from the measurement standard, the bath homogeneity, and from any short term contribution from the instrument being calibrated. The standard deviation of the pressure was calculated from the contributions of the uncertainties originating from the measurement standard, any short term contribution from the instrument, and the uncertainty resulting from the uncertainty in temperature compensation. The reported uncertainty is stated as the standard deviation mutliplied by a factor of two.



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Fax: +1 (905) 873-1992; (800) 516-9081 Tel: +1 (905) 873-2255; (800) 661-2023 Web Site: www.solinst.com

Serial Number: 2090963 Model Number: M100

**Test Results:**

Calibration Date: 6/5/2018

**Pressure Tests**

| Pressure | Reading (6 °C) | Level | Reading | Error (%FS) |
|---|---|---|---|---|
| 15.5 psi | 15.5049 psi | 1.3981 m | 1.4015 m | -0.003% |
| 45.5 psi | 45.4962 psi | 22.5086 m | 22.5060 m | 0.002% |
| 75.5 psi | 75.4926 psi | 43.6191 m | 43.6140 m | 0.004% |
| 105.5 psi | 105.5081 psi | 64.7297 m | 64.7353 m | -0.005% |
| 135.5 psi | 135.4938 psi | 85.8402 m | 85.8359 m | 0.004% |
| 165.5 psi | 165.4910 psi | 106.9507 m | 106.9444 m | 0.005% |

Hysteresis: 0.0004%
Standard Deviation: 0.0042%

**Temperature Tests**

| Temperature | Reading | Error (%FS) |
|---|---|---|
| 6 °C | 6.0007 °C | 0.001% |
| 18 °C | 18.0006 °C | 0.001% |
| 36 °C | 36.0008 °C | 0.001% |

Standard Deviation: 0.0001%

**Conclusion: This instrument fulfils the specifications**

Uncertainty temperature standard: 0.003 °C
Overall uncertainty temperature: ±1.002
Uncertainty pressure standard: <0.003%
Overall uncertainty pressure: 0.01%

Calibration Manager: [redacted]



*For further information, please contact:* ***Solinst Canada Ltd.***
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Solinst®

# Solinst Levelogger Edge Calibration Report

Instrument:

| | |
|---|---|
| Manufacturer: | Solinst Canada |
| Product: | 3001 Levelogger Edge LT |
| Model Number: | M20 |
| Serial Number: | 2117153 |
| Pressure Range: | 0-20 m H20 |
| Resolution: | 0.12 mm H20 |
| Temperature Range: | -20 - +80 °C |
| Temperature Resolution: | 0.003 °C |

Method of Calibration:

The Levelogger is calibrated against a range of set reference points, with units of pressure in pounds per square inch. The conversion factor for pounds per square inch relates to pressure in bars and meters of water column is as follows: 1 pound per square inch = 0.0689476 bar = 0.703070 m H20 @ 4°C.

During the calibration procedure, the Levelogger is fully submerged in a highly accurate water bath, set to 6°C. The pressure is then calibrated to six separate pressure points covering the entire range for that particular Levelogger, to check for any non-linearity. This process is repeated at 18°C and then 36°C to check for temperature effects. The Levelogger is approved after all specifications for accuracy, precision, stability and hysteresis have been met.

Traceability:

Pressure standard: ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, NIST
Temperature standard: ISO/IEC 17025:2005, NVLAP LAB CODE: 200348-0

Uncertainty:

The standard deviation of the temperature was calculated from the contributions of uncertainties originating from the measurement standard, the bath homogeneity, and from any short term contribution from the instrument being calibrated. The standard deviation of the pressure was calculated from the contributions of the uncertainties originating from the measurement standard, any short term contribution from the instrument, and the uncertainty resulting from the uncertainty in temperature compensation. The reported uncertainty is stated as the standard deviation mutliplied by a factor of two.



**For further information, please contact: Solinst Canada Ltd.**
35 Todd Road, Georgetown, Ontario, Canada L7G 4R8 E-mail: instruments@solinst.com
Fax: +1 (905) 873-1992; (800) 516-9081 Tel: +1 (905) 873-2255; (800) 661-2023 Web Site: www.solinst.com

Serial Number: 2117153 Model Number: M20

**Test Results:**

Calibration Date: 1/10/2020

**Pressure Tests**

| Pressure | Reading (6 °C) | Level | Reading | Error (%FS) |
|---|---|---|---|---|
| 15.5 psi | 15.5037 psi | 1.3981 m | 1.4007 m | -0.008% |
| 21.5 psi | 21.4962 psi | 5.6202 m | 5.6175 m | 0.008% |
| 27.5 psi | 27.5036 psi | 9.8423 m | 9.8448 m | -0.008% |
| 33.5 psi | 33.5029 psi | 14.0644 m | 14.0664 m | -0.006% |
| 39.5 psi | 39.4976 psi | 18.2865 m | 18.2848 m | 0.005% |
| 45.5 psi | 45.4993 psi | 22.5086 m | 22.5081 m | 0.002% |

Hysteresis: 0.0064%
Standard Deviation: 0.0072%

**Temperature Tests**

| Temperature | Reading | Error (%FS) |
|---|---|---|
| 6 °C | 5.9999 °C | 0.000% |
| 18 °C | 17.9997 °C | 0.000% |
| 36 °C | 35.9997 °C | 0.000% |

Standard Deviation: 0.0001%

**Conclusion: This instrument fulfils the specifications**

Uncertainty temperature standard: 0.003 °C
Overall uncertainty temperature: ±1.002
Uncertainty pressure standard: <0.003%
Overall uncertainty pressure: 0.01%

Calibration Manager: [redacted]



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# Solinst Levelogger Edge Calibration Report

Instrument:

| | |
|---|---|
| Manufacturer: | Solinst Canada |
| Product: | 3001 Levelogger Edge LT |
| Model Number: | M30 |
| Serial Number: | 2090209 |
| Pressure Range: | 0-30 m H20 |
| Resolution: | 0.18 mm H20 |
| Temperature Range: | -20 - +80 °C |
| Temperature Resolution: | 0.003 °C |

Method of Calibration:

The Levelogger is calibrated against a range of set reference points, with units of pressure in pounds per square inch. The conversion factor for pounds per square inch relates to pressure in bars and meters of water column is as follows: 1 pound per square inch = 0.0689476 bar = 0.703070 m H20 @ 4°C.

During the calibration procedure, the Levelogger is fully submerged in a highly accurate water bath, set to 6°C. The pressure is then calibrated to six separate pressure points covering the entire range for that particular Levelogger, to check for any non-linearity. This process is repeated at 18°C and then 36°C to check for temperature effects. The Levelogger is approved after all specifications for accuracy, precision, stability and hysteresis have been met.

Traceability:

Pressure standard: ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, NIST
Temperature standard: ISO/IEC 17025:2005, NVLAP LAB CODE: 200348-0

Uncertainty:

The standard deviation of the temperature was calculated from the contributions of uncertainties originating from the measurement standard, the bath homogeneity, and from any short term contribution from the instrument being calibrated. The standard deviation of the pressure was calculated from the contributions of the uncertainties originating from the measurement standard, any short term contribution from the instrument, and the uncertainty resulting from the uncertainty in temperature compensation. The reported uncertainty is stated as the standard deviation mutliplied by a factor of two.



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Serial Number: 2090209 Model Number: M30

**Test Results:**

Calibration Date: 5/24/2018

**Pressure Tests**

| Pressure | Reading (6 °C) | Level | Reading | Error (%FS) |
|---|---|---|---|---|
| 15.5 psi | 15.4980 psi | 1.3981 m | 1.3967 m | 0.003% |
| 24.5 psi | 24.5022 psi | 7.7312 m | 7.7328 m | -0.004% |
| 33.5 psi | 33.4973 psi | 14.0644 m | 14.0625 m | 0.005% |
| 42.5 psi | 42.4966 psi | 20.3976 m | 20.3951 m | 0.006% |
| 51.5 psi | 51.5034 psi | 26.7307 m | 26.7331 m | -0.006% |
| 60.5 psi | 60.4976 psi | 33.0639 m | 33.0622 m | 0.004% |

Hysteresis: 0.0012%
Standard Deviation: 0.0047%

**Temperature Tests**

| Temperature | Reading | Error (%FS) |
|---|---|---|
| 6 °C | 5.9999 °C | 0.000% |
| 18 °C | 17.9999 °C | 0.000% |
| 36 °C | 35.9997 °C | 0.000% |

Standard Deviation: 0.0001%

**Conclusion: This instrument fulfils the specifications**

Uncertainty temperature standard: 0.003 °C
Overall uncertainty temperature: ±1.002
Uncertainty pressure standard: <0.003%
Overall uncertainty pressure: 0.01%

Calibration Manager: [redacted]



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# Solinst LTC Edge Calibration Report

Instrument:

| | |
|---|---|
| Manufacturer: | Solinst Canada |
| Product: | 3001 LTC Levelogger Edge |
| Model Number: | M100 |
| Serial Number: | 1074142 |
| Pressure Range: | 0-100 m H20 |
| Resolution: | 0.6 mm H20 |
| Temperature Range: | -20 - +80 °C |
| Temperature Resolution: | 0.003 °C |
| Conductivity Range: @25 C | 50 - 80,000 / µS/cm |

Method of Calibration:

The Levelogger is calibrated against a range of set reference points to an accuracy of 3 decimal places. The units of pressure are in pounds per square inch. The conversion factor for pounds per square inch relates to pressure in bars and meters of water column is as follows: 1 pound per square inch = 0.0689476 bar = 0.703070 m H20 @ 4°C.

During the calibration procedure, the Levelogger is fully submerged in a highly accurate water bath, set to 6°C. The pressure is then calibrated to six separate pressure points covering the entire range of pressure for that particular Levelogger, to check for any non-linearity. This process is repeated at 18°C and then 36°C to check for temperature effects. The Levelogger is approved after all specifications for accuracy, precision, stability and hysteresis have been met.

The LTC Edge is calibrated using thirteen distinct conductivity readings at 25°C. Results are compared to Mettler Toledo S70K Conductivity Meter, which is calibrated on a quarterly basis. During the calibration procedure, the Levelogger is in a water bath at a constant temperature of 25°C. The logger is then calibrated to thirteen conductivity points, covering the range of 50µS/cm to 80,000 µS/cm to check for any non-linearity. Once all specifications for accuracy and stability have been met, the LTC Edge has passed the calibration process.

Traceability:

Pressure standard: ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, NIST
Temperature standard: ISO/IEC 17025:2005, NVLAP LAB CODE: 200348-0
Conductivity Solutions: Confirmed with Mettler Toledo 570 k Conductivity Meter

Uncertainty:

The reported uncertainty is stated as the standard deviation mutliplied by a factor of two. The standard deviation of the temperature was calculated from the contributions of uncertainties originating from the measurement standard, the bath homogeneity, and from any short term contribution from the instrument being calibrated. The standard deviation of the pressure was calculated from the contributions of the uncertainties originating from the measurement standard, any short term contribution from the instrument, and the uncertainty resulting from the uncertainty in temperature compensation

# Solinst LTC Edge Calibration Report

temperature compensation.



## Test Results

Serial Number: 1074142 Model Number: M100 Calibration Date: 5/30/2017

## Pressure Tests

| Pressure | Reading (6°C) | Level | Reading | Error (%FS) |
|---|---|---|---|---|
| 15.5 psi | 15.5041 psi | 1.3981 m | 1.4009 m | -0.003% |
| 45.5 psi | 45.4927 psi | 22.5086 m | 22.5034 m | 0.005% |
| 75.5 psi | 75.5005 psi | 43.6191 m | 43.6195 m | -0.000% |
| 105.5 psi | 105.5022 psi | 64.7297 m | 64.7312 m | -0.001% |
| 135.5 psi | 135.5033 psi | 85.8402 m | 85.8425 m | -0.002% |
| 165.5 psi | 165.4946 psi | 106.9507 m | 106.9469 m | 0.004% |

| | |
|---|---|
| Hysteresis: | 0.0004% |
| Standard Deviation: | 0.0032% |

## Temperature Tests

| Temperature | Reading | Error (%FS) |
|---|---|---|
| 6 °C | 6.0000°C | 0.000% |
| 18 °C | 18.0000°C | 0.000% |
| 36 °C | 36.0000°C | 0.000% |
| Standard Deviation: | 0.0000% | |

## Conductivity Readings

| Reference Meter | LTC | % Error |
|---|---|---|
| 80000 | 79899.21 | -0.1260 |
| 50050 | 49881.79 | -0.3361 |
| 12930 | 13012.07 | 0.6347 |
| 5015 | 5000.87 | -0.2818 |
| 1419.5 | 1396.37 | -1.6298 |
| 501.5 | 502.95 | 0.2899 |
| 84.45 | 84.96 | 0.6081 |

**Conclusion:**

This instrument fulfils the specifications.

Uncertainty temperature standard: 0.003 °C
Overall uncertainty temperature: ±1.002
Uncertainty pressure standard: <0.003%
Overall uncertainty pressure: 0.01%

Calibration Manager:

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# Solinst Levelogger Edge Calibration Report

Instrument:

| | |
|---|---|
| Manufacturer: | Solinst Canada |
| Product: | 3001 Levelogger Edge LT |
| Model Number: | M100 |
| Serial Number: | 2087407 |
| Pressure Range: | 0-100 m H20 |
| Resolution: | 0.6 mm H20 |
| Temperature Range: | -20 - +80 °C |
| Temperature Resolution: | 0.003 °C |

Method of Calibration:

The Levelogger is calibrated against a range of set reference points, with units of pressure in pounds per square inch. The conversion factor for pounds per square inch relates to pressure in bars and meters of water column is as follows: 1 pound per square inch = 0.0689476 bar = 0.703070 m H20 @ 4°C.

During the calibration procedure, the Levelogger is fully submerged in a highly accurate water bath, set to 6°C. The pressure is then calibrated to six separate pressure points covering the entire range for that particular Levelogger, to check for any non-linearity. This process is repeated at 18°C and then 36°C to check for temperature effects. The Levelogger is approved after all specifications for accuracy, precision, stability and hysteresis have been met.

Traceability:

Pressure standard: ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, NIST
Temperature standard: ISO/IEC 17025:2005, NVLAP LAB CODE: 200348-0

Uncertainty:

The standard deviation of the temperature was calculated from the contributions of uncertainties originating from the measurement standard, the bath homogeneity, and from any short term contribution from the instrument being calibrated. The standard deviation of the pressure was calculated from the contributions of the uncertainties originating from the measurement standard, any short term contribution from the instrument, and the uncertainty resulting from the uncertainty in temperature compensation. The reported uncertainty is stated as the standard deviation mutliplied by a factor of two.



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Serial Number: 2087407 Model Number: M100

**Test Results:**

Calibration Date: 3/15/2018

**Pressure Tests**

| Pressure | Reading (6 °C) | Level | Reading | Error (%FS) |
|---|---|---|---|---|
| 15.5 psi | 15.4946 psi | 1.3981 m | 1.3943 m | 0.003% |
| 45.5 psi | 45.5060 psi | 22.5086 m | 22.5129 m | -0.004% |
| 75.5 psi | 75.5087 psi | 43.6191 m | 43.6253 m | -0.005% |
| 105.5 psi | 105.5104 psi | 64.7297 m | 64.7370 m | -0.006% |
| 135.5 psi | 135.4906 psi | 85.8402 m | 85.8336 m | 0.006% |
| 165.5 psi | 165.5077 psi | 106.9507 m | 106.9561 m | -0.005% |

Hysteresis: 0.0010%
Standard Deviation: 0.0050%

**Temperature Tests**

| Temperature | Reading | Error (%FS) |
|---|---|---|
| 6 °C | 6.0004 °C | 0.000% |
| 18 °C | 18.0004 °C | 0.000% |
| 36 °C | 36.0004 °C | 0.000% |

Standard Deviation: 0.0000%

**Conclusion: This instrument fulfils the specifications**

Uncertainty temperature standard: 0.003 °C
Overall uncertainty temperature: ±1.002
Uncertainty pressure standard: <0.003%
Overall uncertainty pressure: 0.01%

Calibration Manager: [redacted]



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# Solinst LTC Edge Calibration Report

Instrument:

| | |
|---|---|
| Manufacturer: | Solinst Canada |
| Product: | 3001 LTC Levelogger Edge |
| Model Number: | M30 |
| Serial Number: | 1075634 |
| Pressure Range: | 0-30 m H20 |
| Resolution: | 0.18 mm H20 |
| Temperature Range: | -20 - +80 °C |
| Temperature Resolution: | 0.003 °C |
| Conductivity Range: @25 C | 50 - 80,000 / µS/cm |

Method of Calibration:

The Levelogger is calibrated against a range of set reference points to an accuracy of 3 decimal places. The units of pressure are in pounds per square inch. The conversion factor for pounds per square inch relates to pressure in bars and meters of water column is as follows: 1 pound per square inch = 0.0689476 bar = 0.703070 m H20 @ 4°C.

During the calibration procedure, the Levelogger is fully submerged in a highly accurate water bath, set to 6°C. The pressure is then calibrated to six separate pressure points covering the entire range of pressure for that particular Levelogger, to check for any non-linearity. This process is repeated at 18°C and then 36°C to check for temperature effects. The Levelogger is approved after all specifications for accuracy, precision, stability and hysteresis have been met.

The LTC Edge is calibrated using thirteen distinct conductivity readings at 25°C. Results are compared to Mettler Toledo S70K Conductivity Meter, which is calibrated on a quarterly basis. During the calibration procedure, the Levelogger is in a water bath at a constant temperature of 25°C. The logger is then calibrated to thirteen conductivity points, covering the range of 50µS/cm to 80,000 µS/cm to check for any non-linearity. Once all specifications for accuracy and stability have been met, the LTC Edge has passed the calibration process.

Traceability:

Pressure standard: ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, NIST
Temperature standard: ISO/IEC 17025:2005, NVLAP LAB CODE: 200348-0
Conductivity Solutions: Confirmed with Mettler Toledo 570 k Conductivity Meter

Uncertainty:

The reported uncertainty is stated as the standard deviation mutliplied by a factor of two. The standard deviation of the temperature was calculated from the contributions of uncertainties originating from the measurement standard, the bath homogeneity, and from any short term contribution from the instrument being calibrated. The standard deviation of the pressure was calculated from the contributions of the uncertainties originating from the measurement standard, any short term contribution from the instrument, and the uncertainty resulting from the uncertainty in temperature compensation

# LTC Edge Calibration Report

temperature compensation.



## Test Results

Serial Number: 1075634 Model Number: M30 Calibration Date: 4/24/2018

## Pressure Tests

| Pressure | Reading (6°C) | Level | Reading | Error (%FS) |
|---|---|---|---|---|
| 15.5 psi | 15.5000 psi | 1.3981 m | 1.3981 m | 0.000% |
| 24.5 psi | 24.5002 psi | 7.7312 m | 7.7314 m | -0.000% |
| 33.5 psi | 33.5001 psi | 14.0644 m | 14.0645 m | -0.000% |
| 42.5 psi | 42.4992 psi | 20.3976 m | 20.3970 m | 0.002% |
| 51.5 psi | 51.5009 psi | 26.7307 m | 26.7313 m | -0.002% |
| 60.5 psi | 60.4994 psi | 33.0639 m | 33.0634 m | 0.001% |

| | |
|---|---|
| Hysteresis: | 0.0012% |
| Standard Deviation: | 0.0013% |

## Temperature Tests

| Temperature | Reading | Error (%FS) |
|---|---|---|
| 6 °C | 5.9998°C | 0.000% |
| 18 °C | 17.9999°C | 0.000% |
| 36 °C | 35.9999°C | 0.000% |
| Standard Deviation: | 0.0000% | |

## Conductivity Readings

| Reference Meter | LTC | % Error |
|---|---|---|
| 80100 | 80119.03 | 0.0238 |
| 50000 | 49962.44 | -0.0751 |
| 12960 | 12960.78 | 0.0060 |
| 5030 | 5015.95 | -0.2794 |
| 1424.5 | 1434.21 | 0.6820 |
| 505 | 504.64 | -0.0719 |
| 84.95 | 84.97 | 0.0220 |

**Conclusion:**

This instrument fulfils the specifications.

Uncertainty temperature standard: 0.003 °C
Overall uncertainty temperature: ±1.002
Uncertainty pressure standard: <0.003%
Overall uncertainty pressure: 0.01%

Calibration Manager:

[redacted]

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# Solinst Levelogger Edge Calibration Report

Instrument:

| | |
|---|---|
| Manufacturer: | Solinst Canada |
| Product: | 3001 LT Barologger |
| Model Number: | M1.5 |
| Serial Number: | 2103372 |
| Pressure Range: | 0-1.5 m H20 |
| Resolution: | 0.03 mm H20 |
| Temperature Range: | -20 - +80 °C |
| Temperature Resolution: | 0.003 °C |

Method of Calibration:

The Levelogger is calibrated against a range of set reference points, with units of pressure in pounds per square inch. The conversion factor for pounds per square inch relates to pressure in bars and meters of water column is as follows: 1 pound per square inch = 0.0689476 bar = 0.703070 m H20 @ 4°C.

During the calibration procedure, the Levelogger is fully submerged in a highly accurate water bath, set to 6°C. The pressure is then calibrated to six separate pressure points covering the entire range for that particular Levelogger, to check for any non-linearity. This process is repeated at 18°C and then 36°C to check for temperature effects. The Levelogger is approved after all specifications for accuracy, precision, stability and hysteresis have been met.

Traceability:

Pressure standard: ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, NIST
Temperature standard: ISO/IEC 17025:2005, NVLAP LAB CODE: 200348-0

Uncertainty:

The standard deviation of the temperature was calculated from the contributions of uncertainties originating from the measurement standard, the bath homogeneity, and from any short term contribution from the instrument being calibrated. The standard deviation of the pressure was calculated from the contributions of the uncertainties originating from the measurement standard, any short term contribution from the instrument, and the uncertainty resulting from the uncertainty in temperature compensation. The reported uncertainty is stated as the standard deviation mutliplied by a factor of two.



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Serial Number: 2103372 Model Number: M1.5

**Test Results:**

Calibration Date: 3/15/2019

**Pressure Tests**

| Pressure | Reading (6 °C) | Level | Reading | Error (%FS) |
|---|---|---|---|---|
| 12.5 psi | 12.5005 psi | -0.7116 m | -0.7113 m | -0.003% |
| 13.2 psi | 13.1495 psi | -0.2546 m | -0.2550 m | 0.003% |
| 13.8 psi | 13.8006 psi | 0.2024 m | 0.2028 m | -0.004% |
| 14.5 psi | 14.4503 psi | 0.6594 m | 0.6596 m | -0.002% |
| 15.1 psi | 15.1005 psi | 1.1164 m | 1.1167 m | -0.003% |
| 15.8 psi | 15.7504 psi | 1.5734 m | 1.5737 m | -0.003% |

Hysteresis: 0.0013%
Standard Deviation: 0.0026%

**Temperature Tests**

| Temperature | Reading | Error (%FS) |
|---|---|---|
| 6 °C | 5.9997 °C | 0.000% |
| 18 °C | 17.9997 °C | 0.000% |
| 36 °C | 35.9998 °C | 0.000% |

Standard Deviation: 0.0001%

**Conclusion: This instrument fulfils the specifications**

Uncertainty temperature standard: 0.003 °C
Overall uncertainty temperature: ±1.002
Uncertainty pressure standard: <0.003%
Overall uncertainty pressure: 0.01%

Calibration Manager: [redacted]



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# Solinst® Levelogger Edge Calibration Report

Instrument:

| | |
|---|---|
| Manufacturer: | Solinst Canada |
| Product: | 3001 Levelogger Edge LT |
| Model Number: | M100 |
| Serial Number: | 2087525 |
| Pressure Range: | 0-100 m H20 |
| Resolution: | 0.6 mm H20 |
| Temperature Range: | -20 - +80 °C |
| Temperature Resolution: | 0.003 °C |

Method of Calibration:

The Levelogger is calibrated against a range of set reference points, with units of pressure in pounds per square inch. The conversion factor for pounds per square inch relates to pressure in bars and meters of water column is as follows: 1 pound per square inch = 0.0689476 bar = 0.703070 m H20 @ 4°C.

During the calibration procedure, the Levelogger is fully submerged in a highly accurate water bath, set to 6°C. The pressure is then calibrated to six separate pressure points covering the entire range for that particular Levelogger, to check for any non-linearity. This process is repeated at 18°C and then 36°C to check for temperature effects. The Levelogger is approved after all specifications for accuracy, precision, stability and hysteresis have been met.

Traceability:

Pressure standard: ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, NIST
Temperature standard: ISO/IEC 17025:2005, NVLAP LAB CODE: 200348-0

Uncertainty:

The standard deviation of the temperature was calculated from the contributions of uncertainties originating from the measurement standard, the bath homogeneity, and from any short term contribution from the instrument being calibrated. The standard deviation of the pressure was calculated from the contributions of the uncertainties originating from the measurement standard, any short term contribution from the instrument, and the uncertainty resulting from the uncertainty in temperature compensation. The reported uncertainty is stated as the standard deviation mutliplied by a factor of two.



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Serial Number: 2087525 Model Number: M100

**Test Results:**

Calibration Date: 4/4/2018

**Pressure Tests**

| Pressure | Reading (6 °C) | Level | Reading | Error (%FS) |
|---|---|---|---|---|
| 15.5 psi | 15.4953 psi | 1.3981 m | 1.3948 m | 0.003% |
| 45.5 psi | 45.5060 psi | 22.5086 m | 22.5129 m | -0.004% |
| 75.5 psi | 75.5058 psi | 43.6191 m | 43.6232 m | -0.003% |
| 105.5 psi | 105.5063 psi | 64.7297 m | 64.7341 m | -0.004% |
| 135.5 psi | 135.4905 psi | 85.8402 m | 85.8335 m | 0.006% |
| 165.5 psi | 165.5088 psi | 106.9507 m | 106.9569 m | -0.005% |

Hysteresis: 0.0011%
Standard Deviation: 0.0045%

**Temperature Tests**

| Temperature | Reading | Error (%FS) |
|---|---|---|
| 6 °C | 6.0003 °C | 0.000% |
| 18 °C | 18.0003 °C | 0.000% |
| 36 °C | 36.0003 °C | 0.000% |

Standard Deviation: 0.0000%

**Conclusion: This instrument fulfils the specifications**

Uncertainty temperature standard: 0.003 °C
Overall uncertainty temperature: ±1.002
Uncertainty pressure standard: <0.003%
Overall uncertainty pressure: 0.01%

Calibration Manager: [redacted]



*For further information, please contact:* ***Solinst Canada Ltd.***
*35 Todd Road, Georgetown, Ontario, Canada L7G 4R8* *E-mail: instruments@solinst.com*
*Fax: +1 (905) 873-1992; (800) 516-9081 Tel: +1 (905) 873-2255; (800) 661-2023 Web Site: www.solinst.com*

# Solinst Levelogger Edge Calibration Report

Instrument:

| | |
|---|---|
| Manufacturer: | Solinst Canada |
| Product: | 3001 Levelogger Edge LT |
| Model Number: | M20 |
| Serial Number: | 2117139 |
| Pressure Range: | 0-20 m H20 |
| Resolution: | 0.12 mm H20 |
| Temperature Range: | -20 - +80 °C |
| Temperature Resolution: | 0.003 °C |

Method of Calibration:

The Levelogger is calibrated against a range of set reference points, with units of pressure in pounds per square inch. The conversion factor for pounds per square inch relates to pressure in bars and meters of water column is as follows: 1 pound per square inch = 0.0689476 bar = 0.703070 m H20 @ 4°C.

During the calibration procedure, the Levelogger is fully submerged in a highly accurate water bath, set to 6°C. The pressure is then calibrated to six separate pressure points covering the entire range for that particular Levelogger, to check for any non-linearity. This process is repeated at 18°C and then 36°C to check for temperature effects. The Levelogger is approved after all specifications for accuracy, precision, stability and hysteresis have been met.

Traceability:

Pressure standard: ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, NIST
Temperature standard: ISO/IEC 17025:2005, NVLAP LAB CODE: 200348-0

Uncertainty:

The standard deviation of the temperature was calculated from the contributions of uncertainties originating from the measurement standard, the bath homogeneity, and from any short term contribution from the instrument being calibrated. The standard deviation of the pressure was calculated from the contributions of the uncertainties originating from the measurement standard, any short term contribution from the instrument, and the uncertainty resulting from the uncertainty in temperature compensation. The reported uncertainty is stated as the standard deviation mutliplied by a factor of two.



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Serial Number: 2117139 Model Number: M20

**Test Results:**

Calibration Date: 1/21/2020

**Pressure Tests**

| Pressure | Reading (6 °C) | Level | Reading | Error (%FS) |
|---|---|---|---|---|
| 15.5 psi | 15.5013 psi | 1.3981 m | 1.3990 m | -0.003% |
| 21.5 psi | 21.4979 psi | 5.6202 m | 5.6187 m | 0.005% |
| 27.5 psi | 27.4976 psi | 9.8423 m | 9.8406 m | 0.005% |
| 33.5 psi | 33.5018 psi | 14.0644 m | 14.0657 m | -0.004% |
| 39.5 psi | 39.5011 psi | 18.2865 m | 18.2873 m | -0.002% |
| 45.5 psi | 45.4994 psi | 22.5086 m | 22.5082 m | 0.001% |

Hysteresis: 0.0017%
Standard Deviation: 0.0040%

**Temperature Tests**

| Temperature | Reading | Error (%FS) |
|---|---|---|
| 6 °C | 5.9996 °C | 0.000% |
| 18 °C | 17.9997 °C | 0.000% |
| 36 °C | 35.9998 °C | 0.000% |

Standard Deviation: 0.0001%

**Conclusion: This instrument fulfils the specifications**

Uncertainty temperature standard: 0.003 °C
Overall uncertainty temperature: ±1.002
Uncertainty pressure standard: <0.003%
Overall uncertainty pressure: 0.01%

Calibration Manager: [redacted]



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Solinst®

# Solinst Levelogger Edge Calibration Report

Instrument:

| | |
|---|---|
| Manufacturer: | Solinst Canada |
| Product: | 3001 LT Barologger |
| Model Number: | M1.5 |
| Serial Number: | 2119095 |
| Pressure Range: | 0-1.5 m H20 |
| Resolution: | 0.03 mm H20 |
| Temperature Range: | -20 - +80 °C |
| Temperature Resolution: | 0.003 °C |

Method of Calibration:

The Levelogger is calibrated against a range of set reference points, with units of pressure in pounds per square inch. The conversion factor for pounds per square inch relates to pressure in bars and meters of water column is as follows: 1 pound per square inch = 0.0689476 bar = 0.703070 m H20 @ 4°C.

During the calibration procedure, the Levelogger is fully submerged in a highly accurate water bath, set to 6°C. The pressure is then calibrated to six separate pressure points covering the entire range for that particular Levelogger, to check for any non-linearity. This process is repeated at 18°C and then 36°C to check for temperature effects. The Levelogger is approved after all specifications for accuracy, precision, stability and hysteresis have been met.

Traceability:

Pressure standard: ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, NIST
Temperature standard: ISO/IEC 17025:2005, NVLAP LAB CODE: 200348-0

Uncertainty:

The standard deviation of the temperature was calculated from the contributions of uncertainties originating from the measurement standard, the bath homogeneity, and from any short term contribution from the instrument being calibrated. The standard deviation of the pressure was calculated from the contributions of the uncertainties originating from the measurement standard, any short term contribution from the instrument, and the uncertainty resulting from the uncertainty in temperature compensation. The reported uncertainty is stated as the standard deviation mutliplied by a factor of two.



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Fax: +1 (905) 873-1992; (800) 516-9081 Tel: +1 (905) 873-2255; (800) 661-2023 Web Site: www.solinst.com

Serial Number: 2119095 Model Number: M1.5

**Test Results:**

Calibration Date: 3/5/2020

**Pressure Tests**

| Pressure | Reading (6 °C) | Level | Reading | Error (%FS) |
|---|---|---|---|---|
| 12.5 psi | 12.4996 psi | -0.7116 m | -0.7119 m | 0.003% |
| 13.2 psi | 13.1494 psi | -0.2546 m | -0.2550 m | 0.004% |
| 13.8 psi | 13.7995 psi | 0.2024 m | 0.2020 m | 0.003% |
| 14.5 psi | 14.4502 psi | 0.6594 m | 0.6595 m | -0.001% |
| 15.1 psi | 15.0997 psi | 1.1164 m | 1.1162 m | 0.002% |
| 15.8 psi | 15.7504 psi | 1.5734 m | 1.5736 m | -0.003% |

Hysteresis: 0.0012%
Standard Deviation: 0.0026%

**Temperature Tests**

| Temperature | Reading | Error (%FS) |
|---|---|---|
| 6 °C | 5.9997 °C | 0.000% |
| 18 °C | 17.9998 °C | 0.000% |
| 36 °C | 35.9997 °C | 0.000% |

Standard Deviation: 0.0000%

**Conclusion: This instrument fulfils the specifications**

Uncertainty temperature standard: 0.003 °C
Overall uncertainty temperature: ±1.002
Uncertainty pressure standard: <0.003%
Overall uncertainty pressure: 0.01%

Calibration Manager: [redacted]



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**Appendix 18: MAG 5100 W Flow Measurement Calibration Report Flowmeter 1**

SIEMENS

Industry Sector

# Factory Calibration Certificate / Werkskalibrierungszertifikat / Certificat d'étalonnage usine

**Topic / Thema / Sujet:** SITRANS F Flowmeter / Durchflussmessgerät / Débitmètre

## *Object / Betreff / Objet:*

| | | |
|---|---|---|
| Flowmeter type / Durchflussmessgerättyp / Type de débitmétre | : | Sitrans FM MAG5100 W |
| Nominal sensor diameter / Messaufnehmer-Nennweite / Diamétre nominal de capteur | : | DN 100 (4") |
| Product order No. / Produktbestellnummer / N° de référence d'appareil | : | 7ME65203TC122AA1 |
| System serial No. / System Seriennummer / N° de série du systeme | : | 216007H048 |

## *Technical data / Technische Daten / Données techniques:*

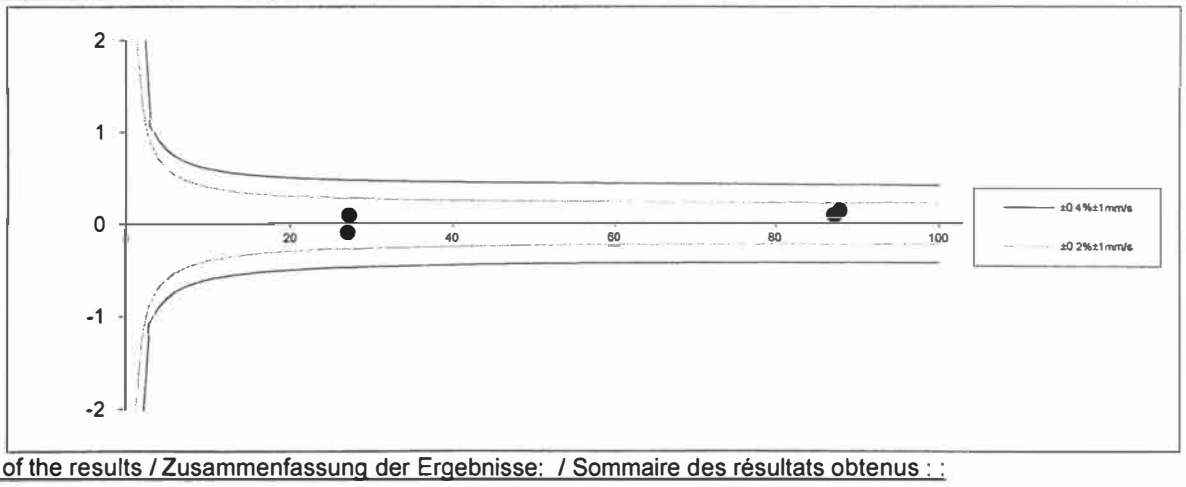
| | | |
|---|---|---|
| Calibration factor / Kalibrierungsfaktor / Facteur d'étalonnage | : | 5.896703251 |
| Calibration medium / Kalibriermedium / Moyen de calibration | : | Water / Wasser / Eau |
| Calibrated full scale flow / Kalibrierter Messbereichsendwert / Fin de plage de mesure étalonnée | : | 140 $m^3$/h / 616.403 US gpm |
| Calibration rig / Kalibrierstand / Plate-forme d'étalonnage | : | LTR HNU |

## *Standards / Normen / Normes:*

Reference meter method (reference meter calibrated according to ISO 4185-1980) / Referenzmessgerätmethode (Referenzgerät kalibriert laut ISO 4185-1980) / Méthode avec compteur de référence (étalonné suivant ISO 4185-1980)

## *Results / Ergebnisse / Résultats:*

| Point # Messpunkt nr Point mesure n° | Flowrate Durchfluss Débit | Fluid temperature Flüssigkeitstemperatur Température du fluide | | Reference flow value Referenz Durchflusswert Débit de référence | | Flowmeter output / Duchflussmessgerätausgang / Sortie de débitmètre | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Flowrate Durchflussmenge / Débit | | Error Fehler / Erreur |
| | [%] | [°C] | [°F] | [$m^3$/h] | [US gpm] | [$m^3$/h] | [US gpm] | [%] |
| 1 | 87 | 18.5 | 65.3 | 122.0778 | 537.4924 | 122.1815 | 537.9489 | 0.09 |
| 2 | 27 | 18.5 | 65.3 | 37.9796 | 167.2193 | 37.9472 | 167.0767 | -0.09 |
| 3 | 27 | 18.6 | 65.5 | 38.2788 | 168.5365 | 38.3126 | 168.6855 | 0.09 |
| 4 | 88 | 18.6 | 65.5 | 123.1081 | 542.0287 | 123.2788 | 542.7801 | 0.14 |



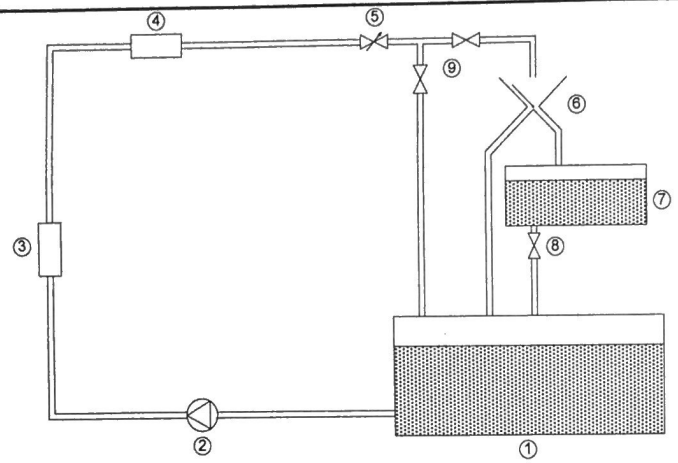

Summary of the results / Zusammenfassung der Ergebnisse: / Sommaire des résultats obtenus : :

- The measured values are within the specified limits / Die gemessenen Werte liegen innerhalb der Toleranzen / Les résultats de mesure se trouvent dans les tolérances définies

| | | |
|---|---|---|
| Siemens SAS<br>Etablissement de Haguenau | Issued by / Erstellt von / émis par<br>Weber | Date / Datum / Date<br>2018/01/31 |

# Factory Calibration Certificate / Werkskalibrierungszertifikat / Certificat d'étalonnage usine

## Test rig characteristics
Prüfstand Merkmale / Caractéristiques de la plate-forme de test




1) Reservoir / Tank / Réservoir
2) Pump / Pumpe / Pompe
3) One or more reference meters / Ein order mehrer Referenz Messgeräte / un ou plusieurs débitmètres de référence
4) Meter under test / Messgerät unter Prüfung / Débitmètre en test
5) Control valve / Kontrollventil / Vanne de régulation
6) Diverter / Kippschaltung / Bascule
7) Weighing tank / Gewichtsmessungstank / Cuve de mesure
8) Drain valve / Abflussventil / Vanne de vidange
9) Valve to switch between reference meter method and static/dynamic weighing method / Ventile zom switchen zwischen Referenz Methode und statische/dynamische Gewichtmessung Methode / Vanne de basculement entre méthode avec débitmètres de référence et méthode par pesée statique or dynamique

| | |
|---|---|
| Test rig ID / Prüfstand ID / ID de la plate-forme de test | **LTR HNU** |
| Fluid / Flüssigkeit / Fluide | **Water** / Wasser / Eau |
| Fluid temperature / Flüssigkeit Temp. / Temp. du fluide | **15-30 °C** / 59-86 °F |
| Test rig capacity / Prüfstand Kapazität / Capacité de la plate-forme | **DN 50...200** / 2"...8" |
| Max. Flowrate / Max. Durchfluss / Débit max. | **340 $m^3$/h** / 1497 US gpm |
| Min. Flowrate / Min. Durchfluss. / Débit min | **2.2 $m^3$/h** / 9.69 US gpm |
| Max. Mass / Max.Masse / Masse max. | **6000 kg** / 13228 lb |
| Uncertainty / Ungenauhigkeit / Incertitude | **+/- 0.1%** |

Traceability / Rückverfolgbarkeit / Traçabilité

The Siemens flowmeter calibration process is ISO9001-certified, ensuring the entire calibration procedure is controlled to the highest quality standards.

All primary measuring instrumentation used by the Siemens Flow Laboratory during the performance of its calibrations, has been calibrated with international standards traceability referring directly to the physical unit of measurement according to the International System of Units (SI). Therefore the calibration certificate ensures recognition of the test results worldwide, including the US (NIST traceability).

Der Siemens Kalibrierungsprozess für Durchflussmessgeräte ist ISO9001 zertifiziert, sicherstellend, dass das ganze Kalibrierungsverfahren nach den höchsten Qualitätsstandards kontrolliert ist.

Alle Hauptmessinstrumente, die zur Durchführung der Kalibrierungen vom Siemens Durchfluss Laboratorium genutzt werden, sind kalibriert, um eine Rückverfolgbarkeit auf internationale Normen sicherzustellen. Dies bezieht sich direkt auf die Maßeinheit gemäß dem Internationalen Einheitensystem (SI). Das Kalibrierungszertifikat gewährleistet daher die Anerkennung der Prüfergebnisse weltweit, einschließlich in den USA (NIST-Rückverfolgbarkeit).

Le processus d'étalonnage des débitmètres Siemens est certifiée ISO9001 et est contrôlé périodiquement selon les normes qualités en vigueur les plus élevées.

Tous les instruments de mesure primaires utilisés dans les laboratoires Siemens Flow durant les opérations d'étalonnage ont été étalonnés en conformité avec les normes internationales relatives à l'unité de mesure physique, conformément au système international d'unités (SI). Le certificat d'étalonnage garantit ainsi que les résultats obtenus lors des essais sont conformes aux normes internationales, y compris NIST (USA).

**Siemens SAS**

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**SIEMENS** Industry Sector

# Quality inspection certificate / Certificat d'inspection qualité

| N° de serie / *Serial number* | 254702H648 |
|---|---|

| VERIFICATION DE L'ASPECT DU SENSOR / Sensor visual aspect check | Resultat / *result* |
|---|---|
| Vérifier le **collage du rebord du liner** / *Check the sticking of the edge of the liner*<br>*Vérifier l'absence de patch sur les electrodes / Check* | OK |
| Vérifier l'**aspect intérieur du liner + montage des electrodes + absence de patch** de protection des electrodes ==> *Voir catalogue d'erreurs FCC*<br>*/ Check the internal appearance of the liner, assembly of electrodes and lack of electrodes patches* | OK |
| Vérifier l'**aspect exterieur de la peinture** (peinture écaillée, rayures, peau d'orange, excès de peinture, impuretés, problèmes d'apparences, nuances de couleur) ==> *Voir catalogue d'erreurs FCC*<br>*/ Check the external appearance of the painting* | OK |
| MAG8000 Afficheur LCD. Vérifier l'**aspect** (propreté, absence de chocs -coins-, film de protection enlevé ) /<br>*MAG8000 LCD display. Check of cosmetic errors (cleanliness, no damage, protective film removed)* | NA |
| Vérifier la **présence de l'étiquette verte + étoile** et contrôler si **collées distinctement**<br>*/ Verify the presence and the good sticking of the green label + Star label* | OK |
| Si **potting** demandé (cockpit) verifier s'il est réalisé **(MAG8000, option Y41, spéciaux)**<br>*/ If MAG8000 check if potting is needed (cockpit) and if it's realized (MAG8000, Y41 option, specials)* | NA |

La signature certifie la conformité des opérations ci-dessus / The signature certify the conformity of the above operations

Nom et visa de l'opérateur / Name and visa controller

Date

ANTOINE Guillaume

30 JAN. 2018

| VERIFICATION DE L'EMBALLAGE | Resultat / *result* |
|---|---|
| **Si MAG8000 Remote** avec potting dans l'electronique - Vérifier concordance des N° de série sur les étiquettes de l'electronique, du couvercle et du sensor / *Compare the serial numbers on the labels between PCBA, the lid and the sensor* | NA |
| Vérification de l'**état de l'emballage** (aspect du carton, présence mousse de protection) => Voir catalogue d'erreurs FCC<br>*/ Verify the condition of the packaging (appearance of the box, foam presence)* | OK |
| **Si batterie au lithium** : Contrôler la présence de l'étiquette "produit dangereux" sur carton<br>*/ If lithium-ion battery : check the presence of the label "Dangerous product" on the box* | NA |

| DIVERS - AUTRES OPTIONS | Resultat / *result* |
|---|---|
| **Certificat de calibration / Product labels / Etiquette emballage / OF :** vérifier la concordance du n° de série système et de la désignation entre les différents supports<br>*/ Calibration certificate - Compare the serial number of the system and designation with the OF* | OK |
| **Product label** - vérifier le Calfactor par rapport au certificat de calibration<br>*/ Check the Calfactor with the calibration certificate* | OK |

La signature certifie la conformité des opérations ci-dessus / The signature certify the conformity of the above operations

Nom et visa de l'opérateur / Name and visa controller

Date

ANTOINE Guillaume

30 JAN. 2018

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**Appendix 19: MAG 5100 W Flow Measurement Calibration Report Flowmeter 2**

**SIEMENS** **Industry Sector**

# Factory Calibration Certificate / Werkskalibrierungszertifikat / Certificat d'étalonnage usine

**Topic / Thema / Sujet:** SITRANS F Flowmeter / Durchflussmessgerät / Débitmètre

## *Object / Betreff / Objet:*

| | | |
|---|---|---|
| Flowmeter type / Durchflussmessgerättyp / Type de débitmètre | : | Sitrans FM MAG5100 W |
| Nominal sensor diameter / Messaufnehmer-Nennweite / Diamètre nominal de capteur | : | DN 100 (4") |
| Product order No. / Produktbestellnummer / N° de référence d'appareil | : | 7ME65203TC122AA1 |
| System serial No. / System Seriennummer / N° de série du systeme | : | 311402H058 |

## *Technical data / Technische Daten / Données techniques:*

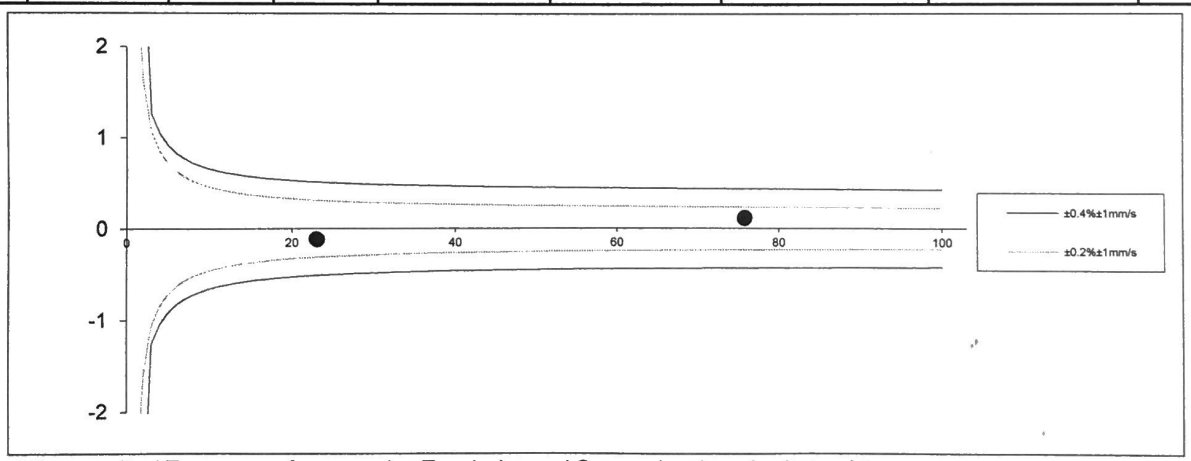
| | | |
|---|---|---|
| Calibration factor / Kalibrierungsfaktor / Facteur d'étalonnage | : | 5.798195839 |
| Calibration medium / Kalibriermedium / Moyen de calibration | : | Water / Wasser / Eau |
| Calibrated full scale flow / Kalibrierter Messbereichsendwert / Fin de plage de mesure étalonnée | : | 110 $m^3/h$ / 484.322 US gpm |
| Calibration rig / Kalibrierstand / Plate-forme d'étalonnage | : | LTR HNU |

## *Standards / Normen / Normes:*

Reference meter method (reference meter calibrated according to ISO 4185-1980) / Referenzmessgerätmethode (Referenzgerät kalibriert laut ISO 4185-1980) / Méthode avec compteur de référence (étalonné suivant ISO 4185-1980)

## *Results / Ergebnisse / Résultats:*

| Point # Messpunkt nr Point mesure n° | Flowrate Durchfluss Débit | Fluid temperature Flüssigkeitstemperatur Température du fluide | | Reference flow value Referenz Durchflusswert Débit de référence | | Flowmeter output / Duchflussmessgerätausgang / Sortie de débitmètre | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Flowrate Durchflussmenge / Débit | | Error Fehler / Erreur |
| | [%] | [°C] | [°F] | [$m^3/h$] | [US gpm] | [$m^3/h$] | [US gpm] | [%] |
| 1 | 23 | 21.9 | 71.4 | 25.2911 | 111.3533 | 25.2626 | 111.2281 | -0.11 |
| 2 | 23 | 21.9 | 71.4 | 25.4009 | 111.8367 | 25.3703 | 111.7020 | -0.12 |
| 3 | 76 | 22.0 | 71.6 | 83.3551 | 367.0016 | 83.4487 | 367.4137 | 0.11 |
| 4 | 76 | 21.9 | 71.4 | 83.4120 | 367.2520 | 83.5128 | 367.6958 | 0.12 |



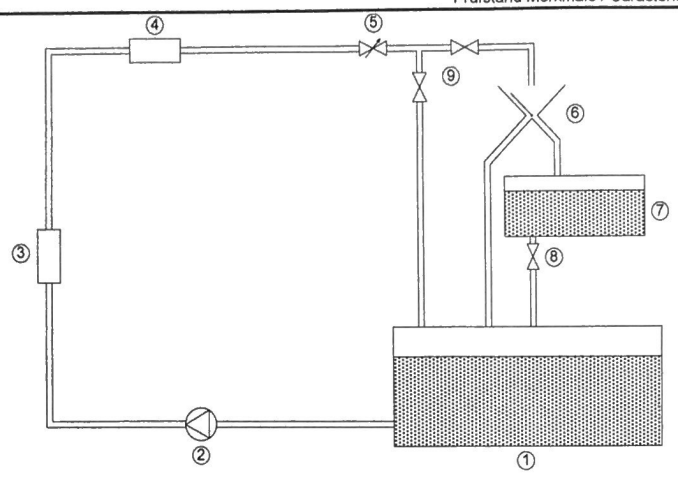

Summary of the results / Zusammenfassung der Ergebnisse: / Sommaire des résultats obtenus : :

- The measured values are within the specified limits / Die gemessenen Werte liegen innerhalb der Toleranzen / Les résultats de mesure se trouvent dans les tolérances définies

| | | |
|---|---|---|
| Siemens SAS<br>Etablissement de Haguenau | Issued by / Erstellt von / émis par<br>Hot | Date / Datum / Date<br>2018/02/01 |

# Factory Calibration Certificate / Werkskalibrierungszertifikat / Certificat d'étalonnage usine

## Test rig characteristics
Prüfstand Merkmale / Caractéristiques de la plate-forme de test




**1) Reservoir / Tank / Réservoir**
**2) Pump / Pumpe / Pompe**
**3) One or more reference meters / Ein order mehrer Referenz Messgeräte / un ou plusieurs débitmètres de référence**
**4) Meter under test / Messgerät unter Prüfung / Débitmètre en test**
**5) Control valve / Kontrollventil / Vanne de régulation**
**6) Diverter / Kippschaltung / Bascule**
**7) Weighing tank / Gewichtsmessungstank / Cuve de mesure**
**8) Drain valve / Abflussventil / Vanne de vidange**
**9) Valve to switch between reference meter method and static/dynamic weighing method / Ventile zom switchen zwischen Referenz Methode und statische/dynamische Gewichtmessung Methode / Vanne de basculement entre méthode avec débitmètres de référence et méthode par pesée statique or dynamique**

| | |
|---|---|
| Test rig ID / Prüfstand ID / ID de la plate-forme de test | **LTR HNU** |
| Fluid / Flüssigkeit / Fluide | **Water** / Wasser / Eau |
| Fluid temperature / Flüssigkeit Temp. / Temp. du fluide | **15-30 °C** / 59-86 °F |
| Test rig capacity / Prüfstand Kapazität / Capacité de la plate-forme | **DN 50...200** / 2"...8" |
| Max. Flowrate / Max. Durchfluss / Débit max. | **340 $m^3/h$** / 1497 US gpm |
| Min. Flowrate / Min. Durchfluss. / Débit min | **2.2 $m^3/h$** / 9.69 US gpm |
| Max. Mass / Max.Masse / Masse max. | **6000 kg** / 13228 lb |
| Uncertainty / Ungenauhigkeit / Incertitude | **+/- 0.1%** |

Traceability / Rückverfolgbarkeit / Traçabilité

The Siemens flowmeter calibration process is ISO9001-certified, ensuring the entire calibration procedure is controlled to the highest quality standards.

All primary measuring instrumentation used by the Siemens Flow Laboratory during the performance of its calibrations, has been calibrated with international standards traceability referring directly to the physical unit of measurement according to the International System of Units (SI). Therefore the calibration certificate ensures recognition of the test results worldwide, including the US (NIST traceability).

Der Siemens Kalibrierungsprozess für Durchflussmessgeräte ist ISO9001 zertifiziert, sicherstellend, dass das ganze Kalibrierungsverfahren nach den höchsten Qualitätsstandards kontrolliert ist.

Alle Hauptmessinstrumente, die zur Durchführung der Kalibrierungen vom Siemens Durchfluss Laboratorium genutzt werden, sind kalibriert, um eine Rückverfolgbarkeit auf internationale Normen sicherzustellen. Dies bezieht sich direkt auf die Maßeinheit gemäß dem Internationalen Einheitensystem (SI). Das Kalibrierungszertifikat gewährleistet daher die Anerkennung der Prüfergebnisse weltweit, einschließlich in den USA (NIST-Rückverfolgbarkeit).

Le processus d'étalonnage des débitmètres Siemens est certifiée ISO9001 et est contrôlé périodiquement selon les normes qualités en vigueur les plus élevées.

Tous les instruments de mesure primaires utilisés dans les laboratoires Siemens Flow durant les opérations d'étalonnage ont été étalonnés en conformité avec les normes internationales relatives à l'unité de mesure physique, conformément au système international d'unités (SI). Le certificat d'étalonnage garantit ainsi que les résultats obtenus lors des essais sont conformes aux normes internationales, y compris NIST (USA).

**Siemens SAS**

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**SIEMENS** **Industry Sector**

# Quality inspection certificate / Certificat d'inspection qualité

| N° de serie / *Serial number* | 3H402H058 |
|---|---|

| VERIFICATION DE L'ASPECT DU SENSOR / Sensor visual aspect check | Resultat / *result* |
|---|---|
| Vérifier le **collage du rebord du liner** / *Check the sticking of the edge of the liner*<br>*Vérifier l'absence de patch sur les electrodes / Check* | OK |
| Vérifier l'**aspect intérieur du liner + montage des electrodes + absence de patch** de protection des electrodes ==> *Voir catalogue d'erreurs FCC*<br>*/ Check the internal appearance of the liner, assembly of electrodes and lack of electrodes patches* | OK |
| Vérifier l'**aspect exterieur de la peinture** (peinture écaillée, rayures, peau d'orange, excès de peinture, impuretés, problèmes d'apparences, nuances de couleur) ==> *Voir catalogue d'erreurs FCC*<br>*/ Check the external appearance of the painting* | OK |
| MAG8000 Afficheur LCD. Vérifier l'**aspect** (propreté, absence de chocs -coins-, film de protection enlevé ) /<br>*MAG8000 LCD display. Check of cosmetic errors (cleanliness, no damage, protective film removed)* | NA |
| Vérifier la **présence de l'étiquette verte + étoile** et contrôler si **collées distinctement**<br>*/ Verify the presence and the good sticking of the green label + Star label* | OK |
| Si **potting** demandé (cockpit) verifier s'il est réalisé **(MAG8000, option Y41, spéciaux)**<br>*/ If MAG8000 check if potting is needed (cockpit) and if it's realized (MAG8000, Y41 option, specials)* | NA |

La signature certifie la conformité des opérations ci-dessus / The signature certify the conformity of the above operations

Nom et visa de l'opérateur / Name and visa controller

Date

ANTOINE Guillaume

01 FEV. 2018

| VERIFICATION DE L'EMBALLAGE | Resultat / *result* |
|---|---|
| **Si MAG8000 Remote** avec potting dans l'electronique - Vérifier concordance des N° de série sur les étiquettes de l'electronique, du couvercle et du sensor / *Compare the serial numbers on the labels between PCBA, the lid and the sensor* | NA |
| Vérification de l'**état de l'emballage** (aspect du carton, présence mousse de protection) => Voir catalogue d'erreurs FCC<br>*/ Verify the condition of the packaging (appearance of the box, foam presence)* | OK |
| **Si batterie au lithium** : Contrôler la présence de l'étiquette "produit dangereux" sur carton<br>*/ If lithium-ion battery : check the presence of the label "Dangerous product" on the box* | NA |

| DIVERS - AUTRES OPTIONS | Resultat / *result* |
|---|---|
| **Certificat de calibration / Product labels / Etiquette emballage / OF :** vérifier la concordance du n° de série système et de la désignation entre les différents supports<br>*/ Calibration certificate - Compare the serial number of the system and designation with the OF* | OK |
| **Product label** - vérifier le Calfactor par rapport au certificat de calibration<br>*/ Check the Calfactor with the calibration certificate* | OK |

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Nom et visa de l'opérateur / Name and visa controller

Date

ANTOINE Guillaume

01 FEV. 2018

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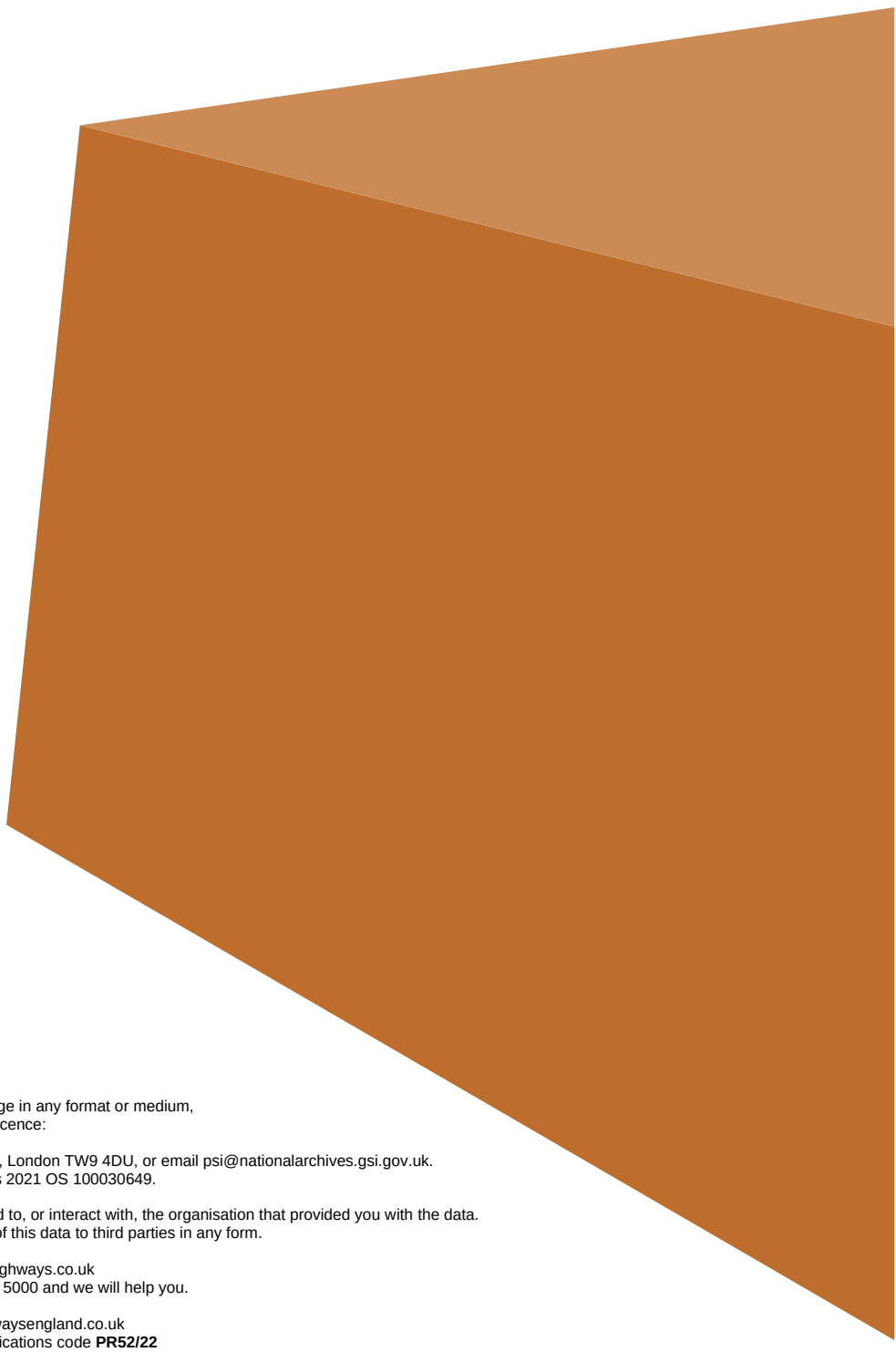



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