

3 April 2023
Project No. 5019962
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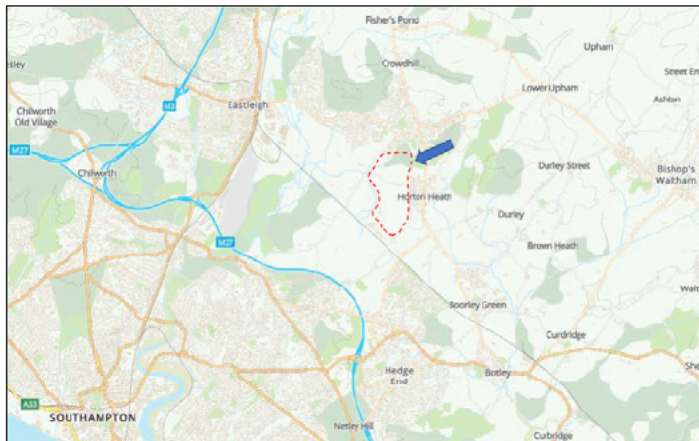
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One Horton Heath – Winter Groundwater Monitoring

We write following completion of winter groundwater monitoring at land near Horton Heath, Hampshire, broadly centred on 448877 E 117310 N and shown on the image below.



Extract 1: Site Location Plan

This report follows the issue of a Ridge Geotechnical Investigation Report (Ref: 5019962-RDG-XX-ST-DOC-C-00GIR01) on 3 February 2023.

As part of the Geotechnical Investigation eleven boreholes were installed with 50mm diameter standpipes to circa 2.50mbgl to allow monitoring of groundwater levels across the site.

This letter report relates specifically to winter groundwater monitoring to inform the site surface water drainage design. The scope of monitoring was defined in the August 2022 document – 'Project Brief for Geotechnical Investigations v4'.

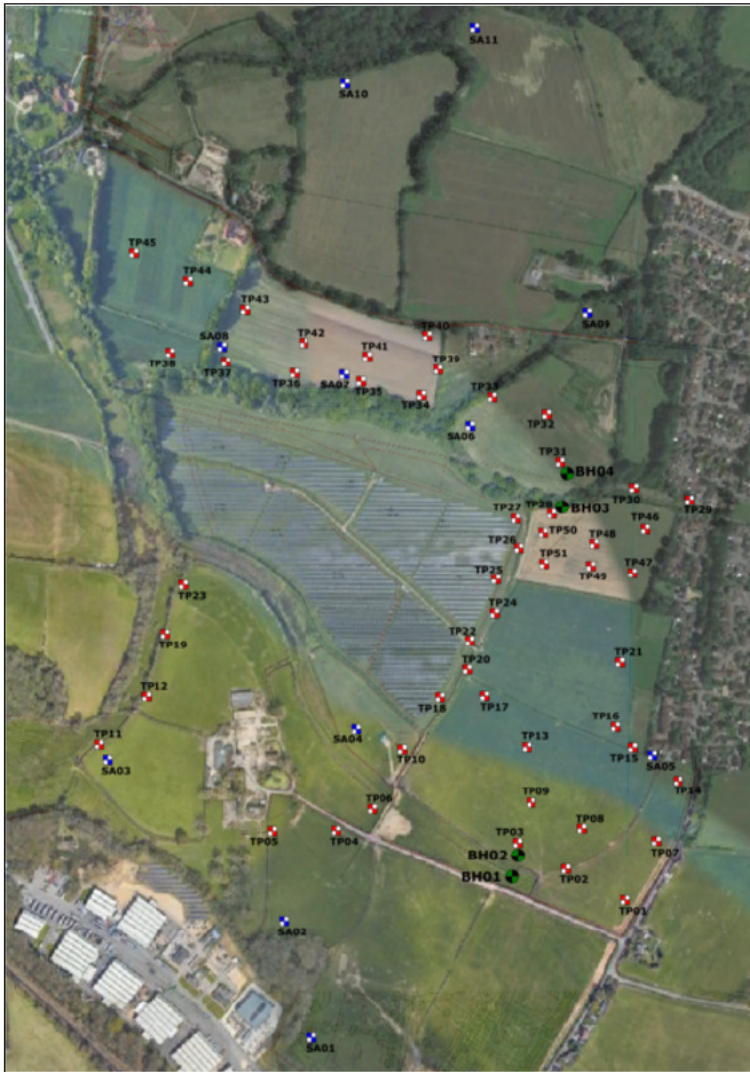
This report provides commentary on groundwater gauging rounds conducted 3 November 2022 to 30 March 2023.

The previous (GI) report issued in February 2023 should be referred to for information relating to intrusive field works.

Groundwater Monitoring

Monitoring wells (11no.) were monitored on average every month. Groundwater levels were recorded to enable assessment of the water table regime beneath the site.

Monitoring well locations are shown on Extract 2 below and are coloured blue. These locations were specified within 'Project Brief for Geotechnical Investigations v4'.

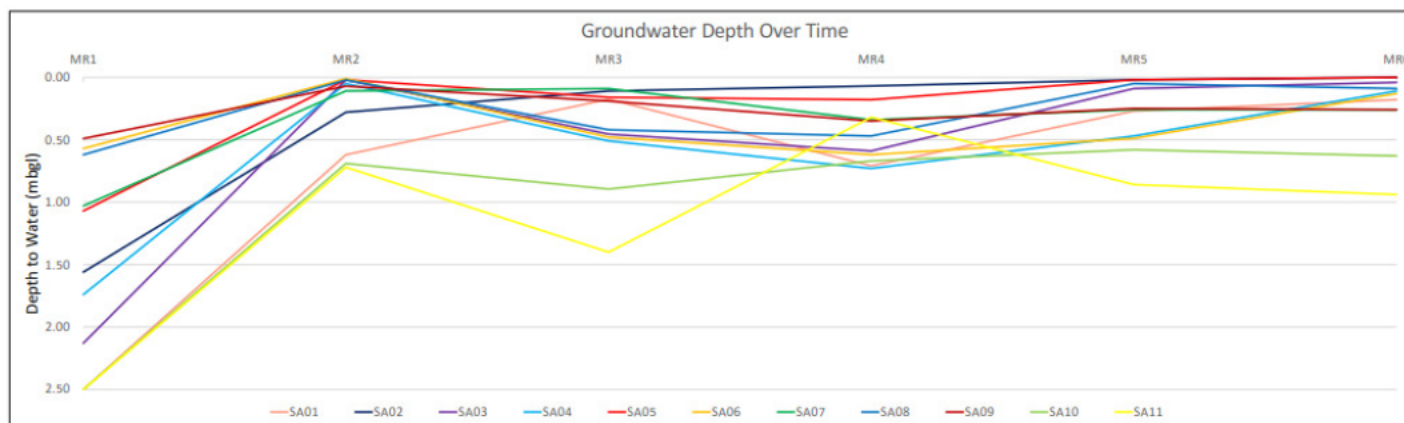


Extract 2: Test Location Plan

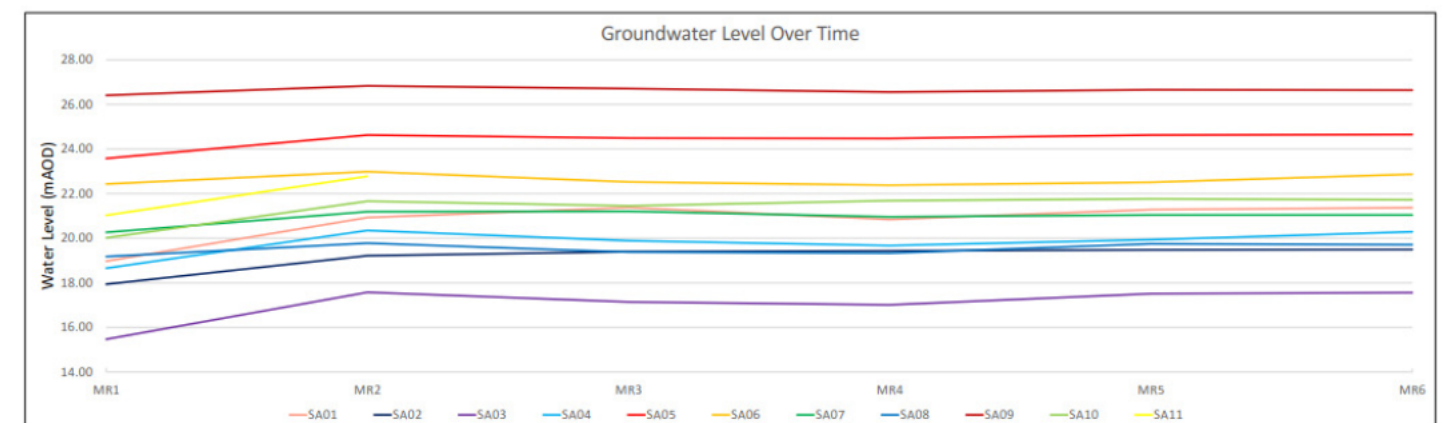
Monitoring results are shown in Table 1, and Graphs 1 and 2 below.

mAOD		03/11/2022			06/01/2023			02/02/2023			21/02/2023			13/03/2023			30/03/2023		
		MR1			MR2			MR3			MR4			MR5			MR6		
		Depth to Water (mbgl)	Water Level (mAOD)	Depth to Base (mbgl)	Depth to Water (mbgl)	Water Level (mAOD)	Depth to Base (mbgl)	Depth to Water (mbgl)	Water Level (mAOD)	Depth to Base (mbgl)	Depth to Water (mbgl)	Water Level (mAOD)	Depth to Base (mbgl)	Depth to Water (mbgl)	Water Level (mAOD)	Depth to Base (mbgl)	Depth to Water (mbgl)	Water Level (mAOD)	Depth to Base (mbgl)
21.55	SA01	Dry	18.97	2.58	0.62	20.93	2.61	0.18	21.38	2.66	0.71	20.84	2.62	0.27	21.28	2.61	0.18	21.37	2.60
19.50	SA02	1.56	17.94	2.63	0.28	19.22	2.52	0.11	19.39	2.71	0.07	19.43	2.54	0.02	19.48	2.52	0.00	19.50	2.49
17.60	SA03	2.13	15.47	2.53	0.02	17.58	2.34	0.46	17.15	2.46	0.59	17.01	2.36	0.09	17.51	2.36	0.04	17.56	2.36
20.40	SA04	1.74	18.66	2.42	0.05	20.35	2.41	0.51	19.89	2.26	0.73	19.67	2.39	0.47	19.93	2.38	0.11	20.29	2.38
24.65	SA05	1.07	23.58	2.37	0.02	24.63	2.32	0.16	24.49	2.32	0.18	24.47	2.35	0.02	24.63	2.31	0.00	24.65	2.33
23.00	SA06	0.57	22.43	2.54	0.01	22.99	2.51	0.48	22.52	2.57	0.62	22.38	2.52	0.49	22.51	2.55	0.13	22.87	2.54
21.30	SA07	1.03	20.27	2.49	0.11	21.19	2.39	0.09	21.21	2.50	0.34	20.96	2.48	0.26	21.04	2.47	0.26	21.04	2.47
19.80	SA08	0.62	19.18	2.51	0.02	19.78	2.48	0.42	19.38	2.49	0.47	19.33	2.46	0.05	19.75	2.40	0.09	19.71	2.36
26.90	SA09	0.49	26.41	2.49	0.07	26.83	2.51	0.19	26.71	2.54	0.35	26.55	2.49	0.25	26.65	2.50	0.26	26.64	2.48
22.35	SA10	Dry	20.02	2.33	0.69	21.66	2.27	0.90	21.46	2.48	0.67	21.68	2.36	0.58	21.77	2.35	0.63	21.72	2.35
23.50	SA11	Dry	21.03	2.47	0.72	22.78	2.42	1.40	22.10	2.44	0.32	23.18	2.42	0.86	22.64	2.42	0.94	22.56	2.40

Table 1: Groundwater Monitoring Data



Graph 1: Groundwater Monitoring Data - mbgl



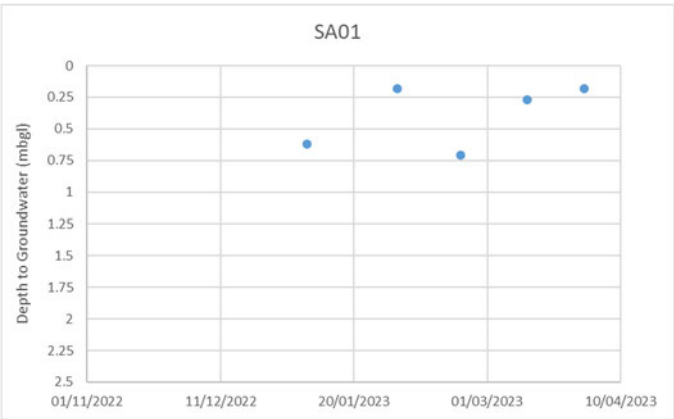
Graph 2: Groundwater Monitoring Data - mAOD

Most of the results indicate that water levels are within 1m from ground level for most of the monitoring programme. Results from MR1 indicate that the wells took a little time to equilibrate after installation.

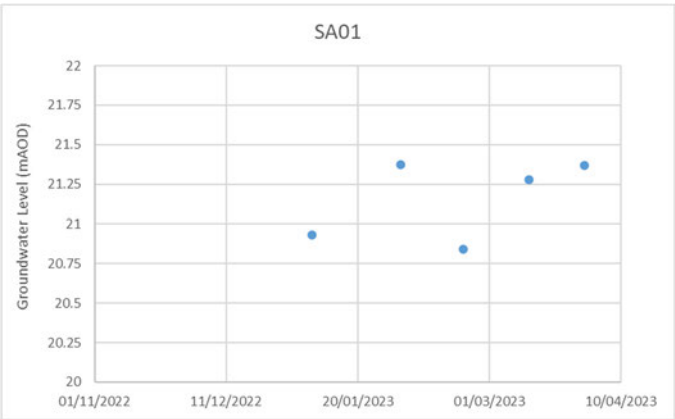
Water levels ranged between 15.47mAOD and 26.83mAOD across the monitoring programme.

SA01

A closer review of the data from SA01 shows that during the monitoring period groundwater was within 0.75m of ground level. The well was dry during MR1. Groundwater levels generally ranged between approximately 20.75mAOD and 21.50mAOD.



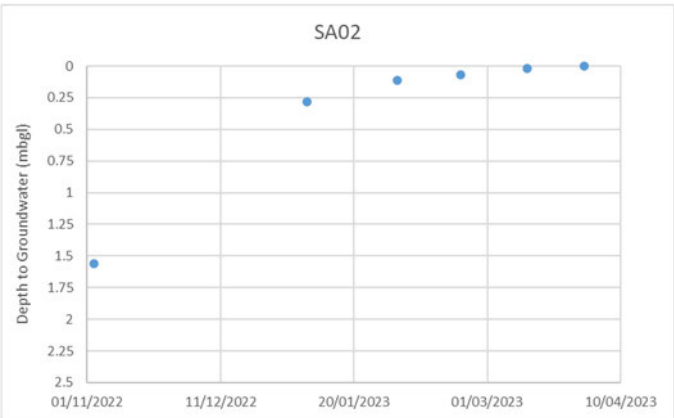
Graph SA01: mbgl



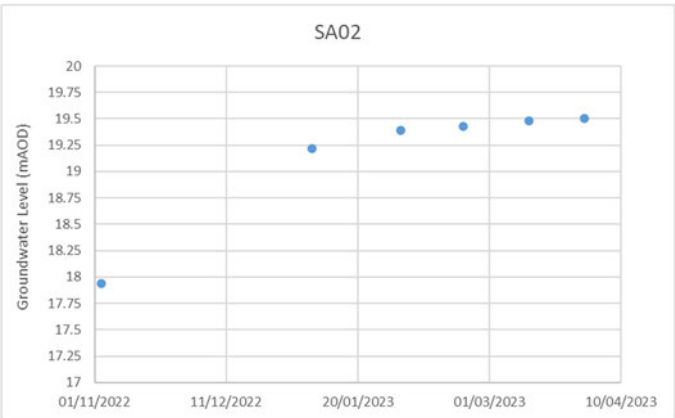
Graph SA01: mAOD

SA02

Following borehole installation groundwater rises to ground surface level in March 2023. The majority of readings show depth to groundwater within 0.25m of ground surface. Groundwater level is for the most part between 19mAOD and 19.50mAOD.



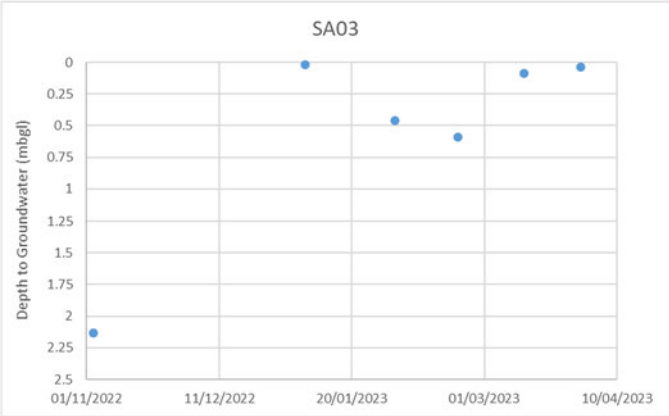
Graph SA02: mbgl



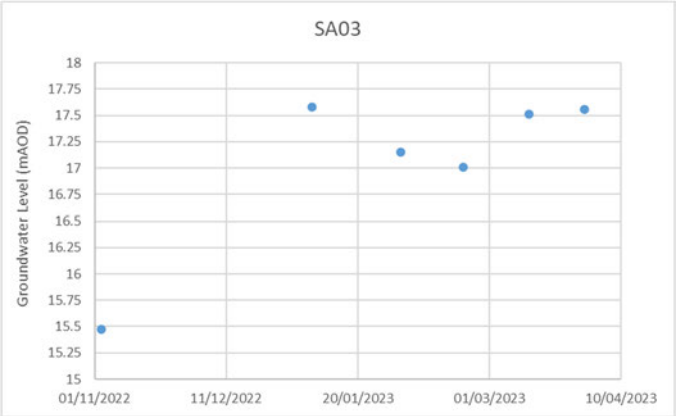
Graph SA02: mAOD

SA03

Following the first monitoring round depth to groundwater is within 0.75m of ground surface. Groundwater level ranges between approximately 17.00mAOD and 17.75mAOD following the first round of monitoring.



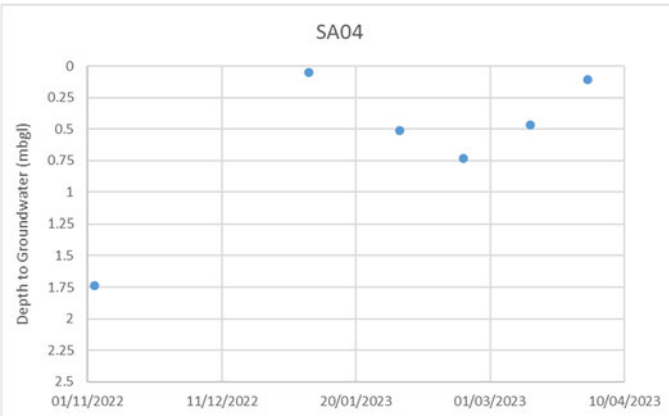
Graph SA03: mbgl



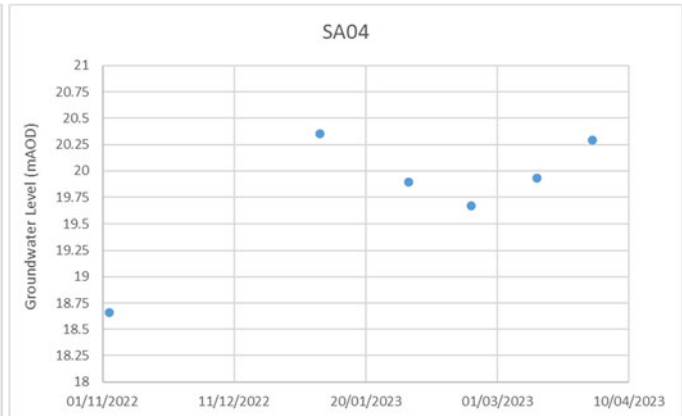
Graph SA03: mAOD

SA04

Depth to groundwater is within 0.75m of the ground surface for most of the monitoring period. For the most part groundwater levels are between 19.50mAOD and 20.50mAOD.



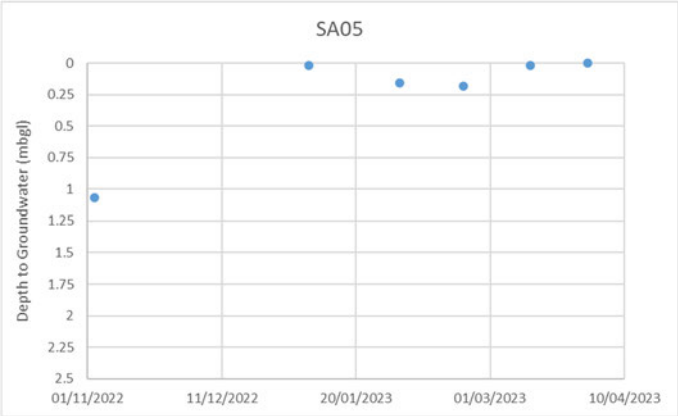
Graph SA04: mbgl



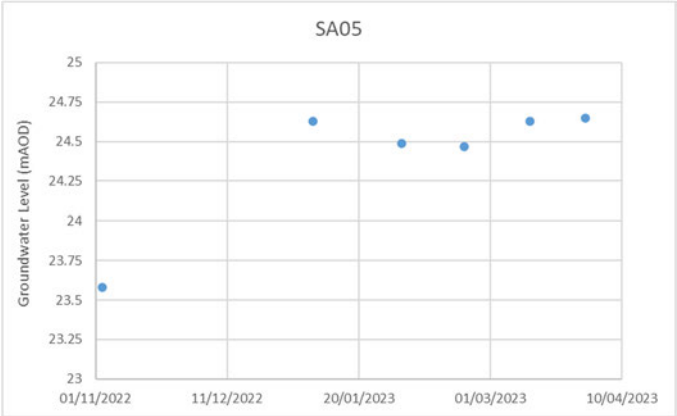
Graph SA04: mAOD

SA05

With the exception of the initial monitoring round, groundwater levels are within 0.25m of the ground surface and range between approximately 24.25mAOD and 24.75mAOD.



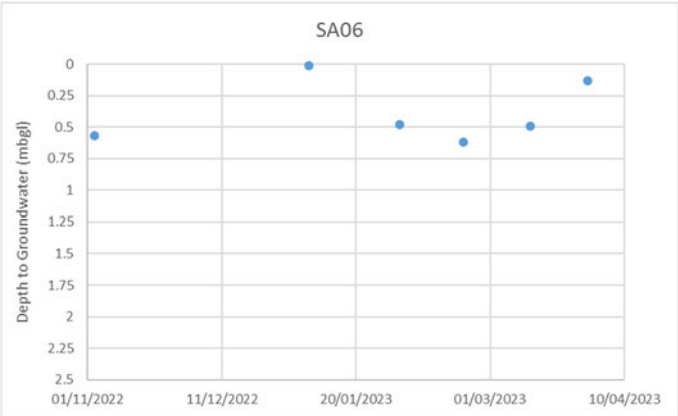
Graph SA05: mbgl



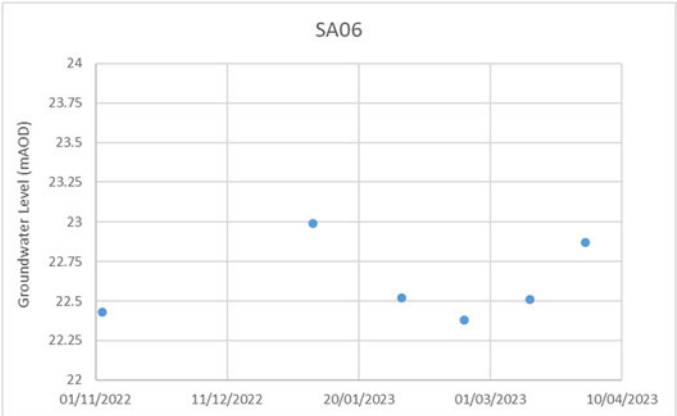
Graph SA05: mAOD

SA06

Depth to groundwater is within 0.75m from ground surface across the entire monitoring programme. Groundwater levels range from circa 22.25mAOD to 23.00mAOD.



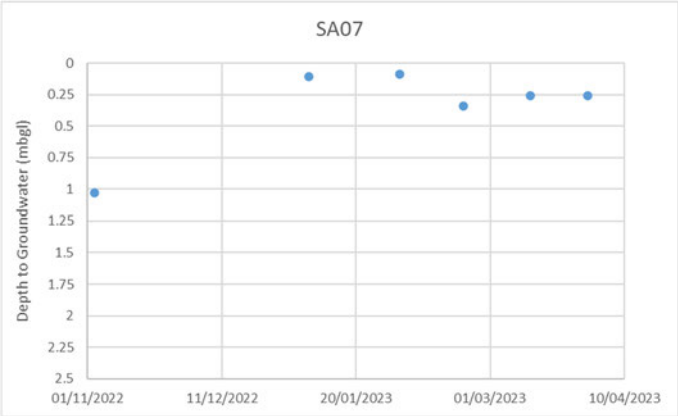
Graph SA06: mbgl



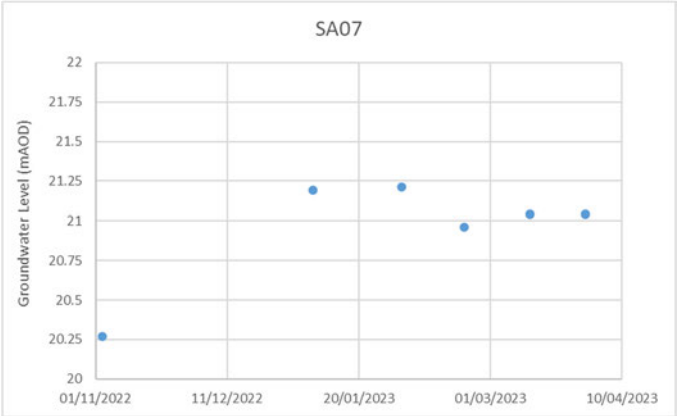
Graph SA06: mAOD

SA07

The majority of monitoring rounds show groundwater to rest within 0.50m of ground surface. Groundwater levels range from circa 20.25mAOD to 21.25mAOD across the programme.



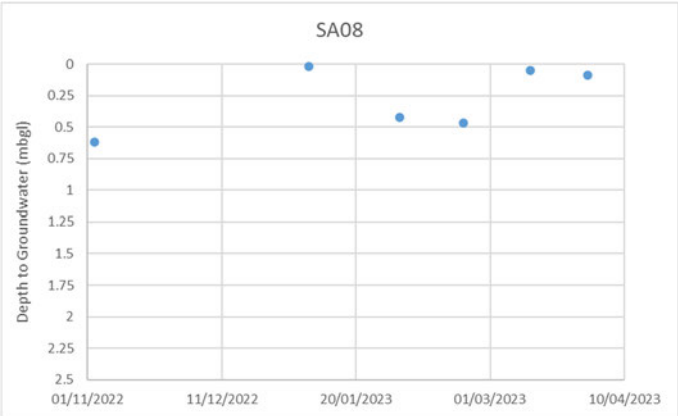
Graph SA07: mbgl



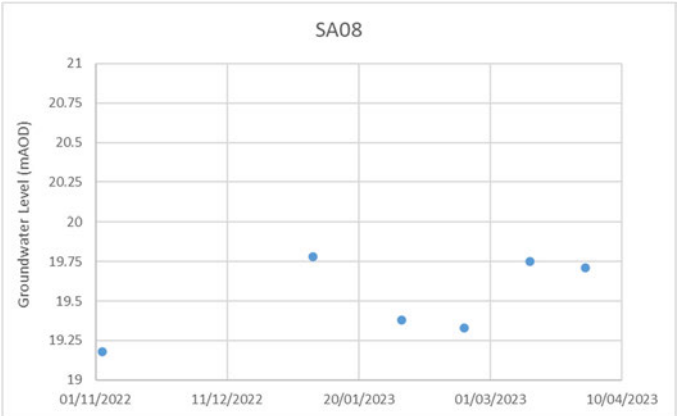
Graph SA07: mAOD

SA08

Groundwater levels across the monitoring programme were within 0.75m of ground surface and ranged from circa 19.00mAOD to circa 19.75mAOD.



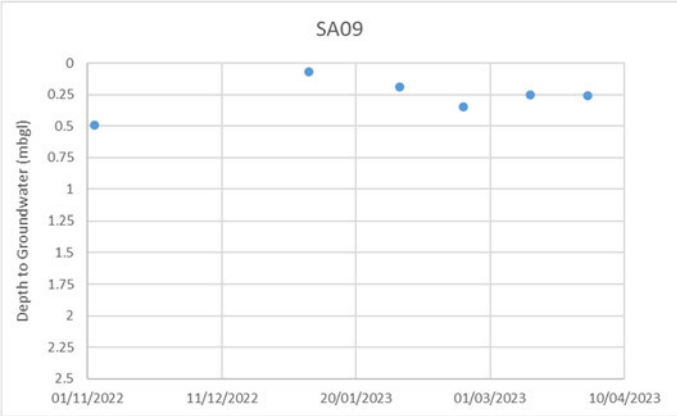
Graph SA08: mbgl



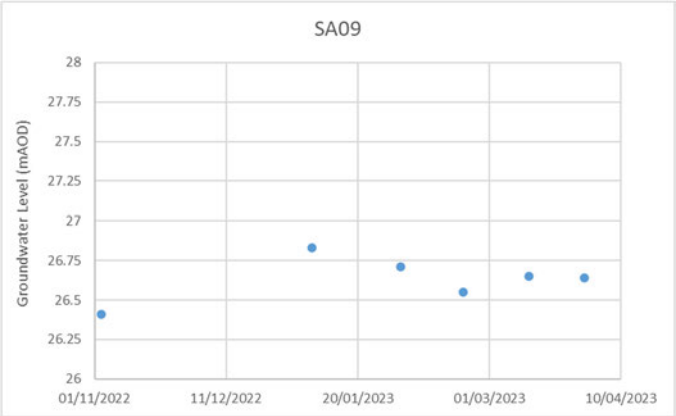
Graph SA08: mAOD

SA09

All readings were within 0.50m of ground surface across the monitoring programme. This translates to groundwater levels ranging between circa 26.25mAOD and 27.00mAOD.



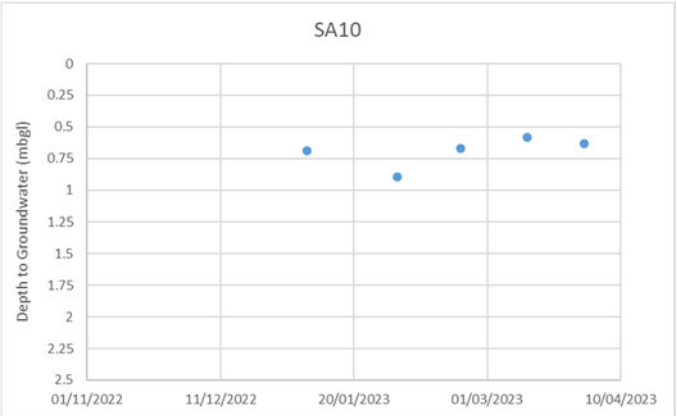
Graph SA09: mbgl



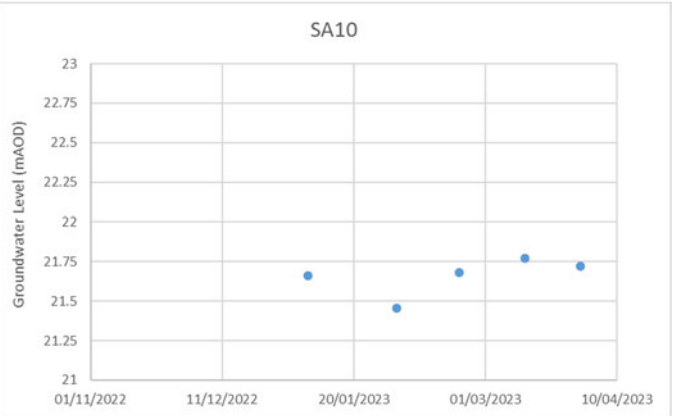
Graph SA09: mAOD

SA10

The monitoring well was dry on the first round, but following this groundwater was observed consistently between 0.50mbgl and 1.00mbgl, and circa 21.50-21.75mAOD.



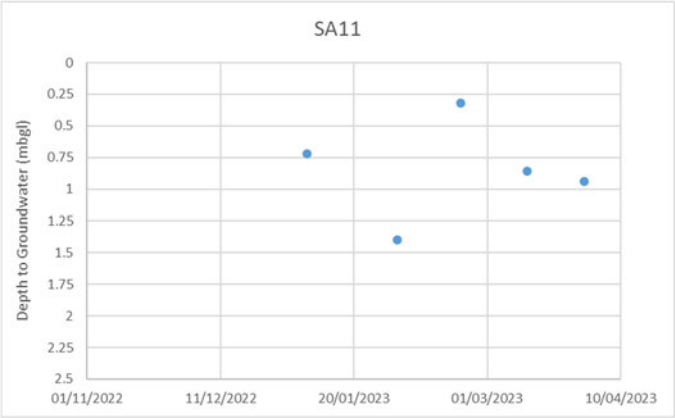
Graph SA10: mbgl



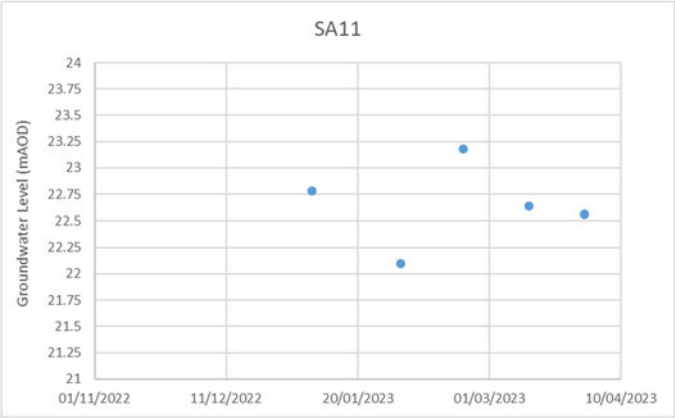
Graph SA10: mAOD

SA11

The monitoring well was dry during the initial monitoring round, but following this levels ranged from circa 1.50-0.25mbgl and approximately 22.00-23.25mAOD.



Graph SA11: mbgl



Graph SA11: mAOD

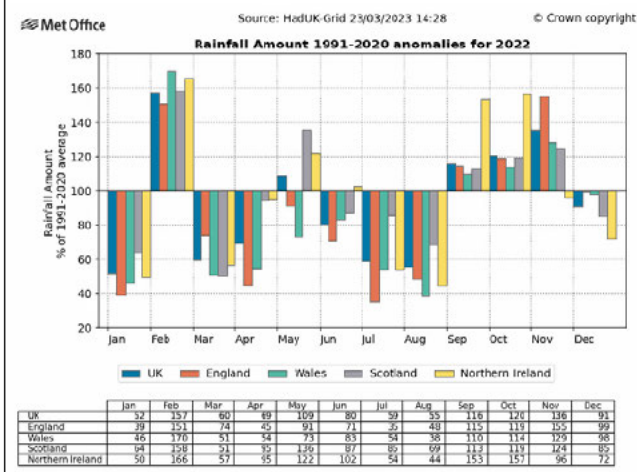
Rainfall Trends

Graphs below show nationwide rainfall trends in 2022 and the early part of 2023. March 2023 data is not yet available. This data has been sourced from the Met Office.

Data shows that rainfall in October 2022, November 2022 and January 2023 were above average in England.

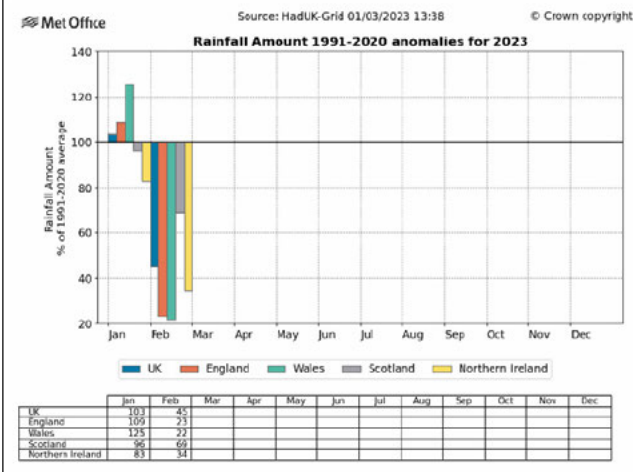
Rainfall, 1991 - 2020 anomaly

2022

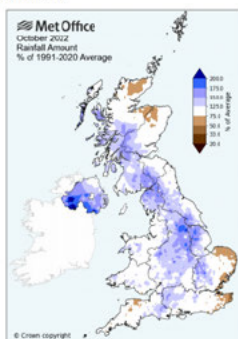


Rainfall, 1991 - 2020 anomaly

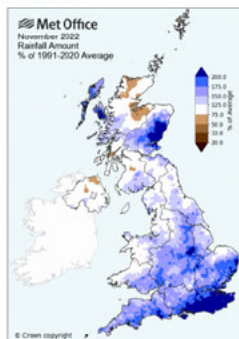
2023



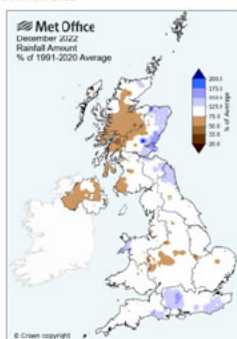
Rainfall 1991 - 2020 anomaly
October 2022



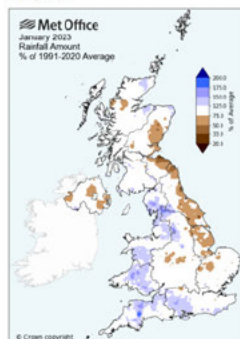
Rainfall 1991 - 2020 anomaly
November 2022



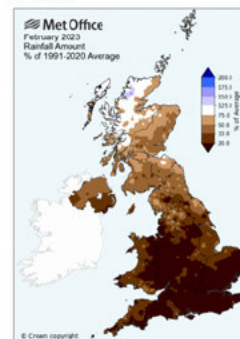
Rainfall 1991 - 2020 anomaly
December 2022



Rainfall 1991 - 2020 anomaly
January 2023



Rainfall 1991 - 2020 anomaly
February 2023



The table below shows rainfall data from 2022 and 2023 at Southampton Airport, which is just 3km from the site. This data has been sourced directly from Southampton Weather, units in mm.

The data shows that rainfall in November 2022, December 2022, January 2023 and March 2023 was well above average for the 2009-2023 dataset.

Rainfall													
Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
2023	129.7	6.8	132.7										269.2*
2022	26.6	64.8	61.4	18.1	53.0	52.3	1.4	34.5	105.2	90.7	209.7	123.7	841.4
Avg	102.3	75.7	70.1	50.5	57.9	64.3	52.8	70.9	59.7	105.2	106.1	109.0	924.3

Conclusions

Monitoring was carried out from 3 November 2022 through to 30 March 2023. Groundwater levels have been recorded at each specified location.

A review of national and local rainfall data indicates that November 2022 to January 2023 have been on the whole wetter than average.

At this stage it is unclear whether groundwater levels have peaked across the site, and therefore we recommend additional rounds to capture peak levels, and subsequent fall in groundwater level. Furthermore, it may be prudent to continue groundwater monitoring through another wet season to increase the dataset.

Close

We assume the above is adequate for your requirements at this stage. If you have any queries, please do not hesitate to contact the undersigned.

Yours sincerely

A large black rectangular box redacting the signature of the Principal Geo-Environmental Engineer.

Principal Geo-Environmental Engineer
For Ridge and Partners LLP

Enclosures **Report Conditions**

Report Conditions

This report is produced solely for the benefit of **Eastleigh Borough Council** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the Site.

Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification.