



**Howley Energy  
& Water Limited**

# Factual Report For Open Loop Ground Source Heat Exchange System Test Boreholes

The Ernest Dence Estate  
The Royal Borough of Greenwich Council

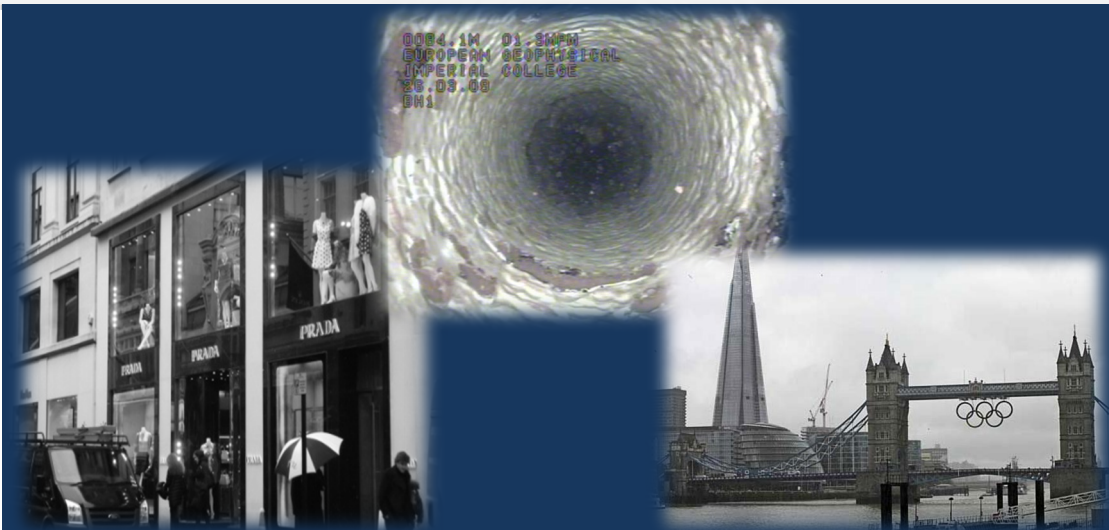
30<sup>th</sup> September 2020

PROJECT  
MANAGEMENT

DESIGN

CONSULTANCY

FEASIBILITY



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Tel : 02477 360063 [www.howleyenergy.co.uk](http://www.howleyenergy.co.uk)  
Company Reg No 10571914 VAT Reg No. 260 1634 35

## **Background**

Howley Energy & Water Ltd ( HEW ) were instructed by Sustainable Energy Ltd to assess the potential viability towards the development of an open loop ground source heat exchange system at The Ernest Dence Estate in Greenwich, South East London for the Royal Borough of Greenwich Council.

An initial high level feasibility investigation was carried out on 25<sup>th</sup> August 2017. The report advised that the site was expected to be underlain by two horizons that held groundwater - namely the Floodplain Gravels or River Terrace Deposits ( RTD ) and the Upper Chalk. The client team decided that their preferred approach strategy was to try to exploit the RTD through the drilling of test boreholes, which if successful would go on to potentially form part of the open loop ground source energy system.

Additional technical assessment exercises involved hydraulic and thermal modelling. This task was undertaken on 27<sup>th</sup> September 2019 to try to offer some detail towards the best positioning of the boreholes to avoid or reduce the potential undesirable impact of hydraulic and thermal migration within the RTD aquifer.

Silt / sand ingress is known to be a risk when exploiting the RTD - especially at sites in such close proximity to a river which in this case, is known to have high levels of sand particulate carried within it. Technical assessments suggested that the abstraction borehole(s) would probably be best to be located to the south of the boundary line close to Old Woolwich Road ( ie as far away from the river as possible ) and the recharge borehole(s) closer to the river.

An application was made to the Environment Agency for a formal Consent to Investigate a Groundwater Source and permission to drill and test 1nr abstraction and 1nr recharge borehole was gained on 1<sup>st</sup> November 2019 with a view to commencing works in the early part of 2020 once a contractor had been engaged. Delays in the procurement process and more recently, the global pandemic saw the on site works delayed.

### ***Contractor Engagement***

Howley Energy & Water Ltd produced a technical specification for the drilling and testing of the River Terrace Deposits entitled 30<sup>th</sup> September 2019. This document was used for invited drilling contractors to offer a cost against the specified works. Those invited to bid were;

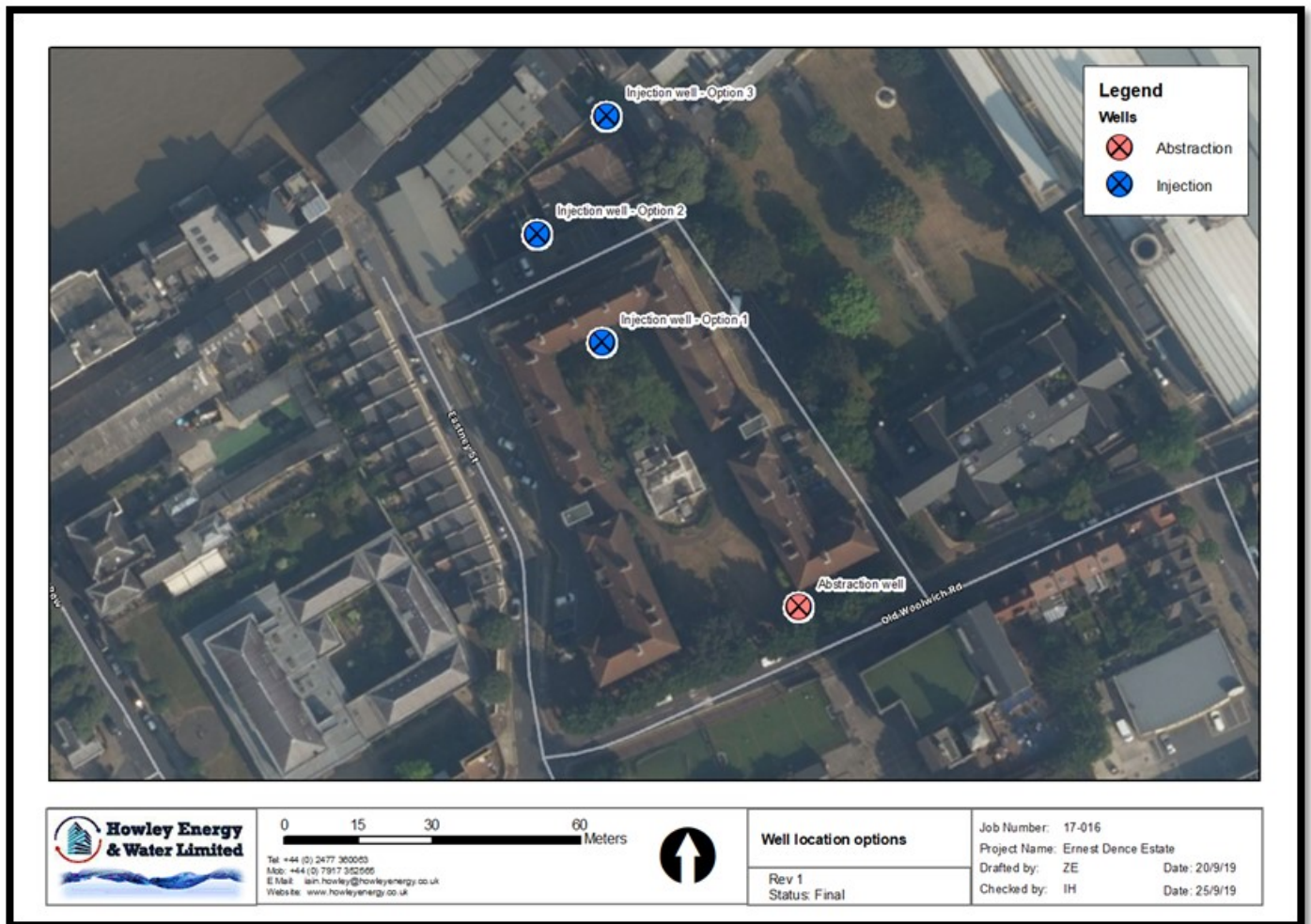
- WJ Groundwater Ltd
- Project Dewatering Ltd
- Drilling and Servicing Co Ltd

After the works had been tendered through the RBGC procurement process, Project Dewatering Ltd were appointed to complete the works. Delays introduced by the global pandemic ( Covid-19 ) meant that the crew didn't mobilise to site until 13<sup>th</sup> July 2020.

The target flow rate for the open loop system was advised by Sustainable Energy Ltd to be c. 15 l/sec. This flow rate would be considered to be towards the top end of what may be possible in


terms of yield achievement from the RTD but in areas where transmissivity and permeability of the gravels is high then higher flow rates could be achieved.

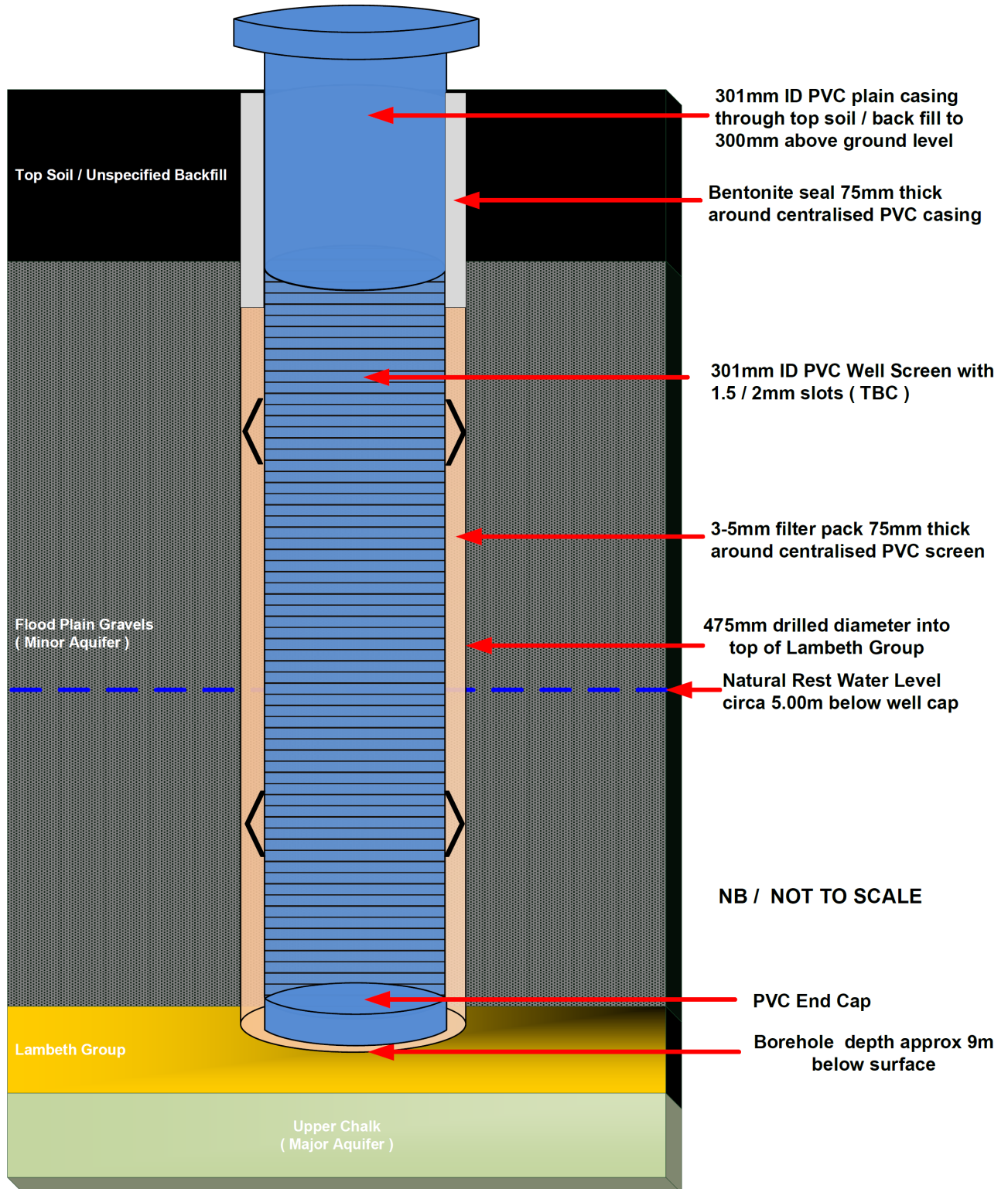
On 13<sup>th</sup> July 2020, the PDL drilling team gained access to the site and drilled the abstraction borehole to the south of the site boundary as detailed in the aerial image blow.



The borehole was completed in line with the schematic below and because of the high flows sought for this project, a 2mm slot size was chosen to try to maintain enough open-area in the well screen to offer the best chance of achieving the flows demanded from the relatively thin horizon of productive RTD.



	<b>Expected Geological Sequence and Borehole Depths</b> <b>Ernest Dence District Heating System - Greenwich</b>		
	Borehole No <b>1&amp;2</b>	Date <b>August 2019</b>	Contract Open Loop Ground Source System
Royal Borough Of Greenwich	SCALE : Not To Scale	SHEET	1 OF 1



Upon completion of the borehole, development and yield assessment pumping was initiated. The pump used was a high capacity unit capable of delivering up to 15 l/sec. Upon start up, it was immediately clear that the borehole was being completely dewatered and the achievable yield was going to be considerably less than the 15 l/sec hoped for.

The pump unit was throttled back to determine what the achievable flow rate was whilst maintaining a steady pumping water level. The hydraulically sustainable flow rate was estimated to be between 1.6 and 1.8 l/sec. Pumping continued for a short period of time and the flow observed for both flow rates and water quality. Although discoloured, there were no signs of sand ingress during the pumping operation. With the flow being so low, it was deemed unnecessary to continue with formal test pumping and the client team were immediately informed of the results of initial pump testing.

PDL were stood down whilst the client team decided how to proceed with the project. After a number of discussions with the client team, it was decided that the second borehole that formed the original approach strategy could be drilled with the potential to switch the orientation of the boreholes around so that if higher yields were gained by the second borehole then this could become the abstraction borehole and the first would now be the recharge borehole. Although, it was felt that higher yields could well be realised because of the greater degree of saturated gravels that were expected closer to the river, there was a greater risk of sand ingress.

PDL returned to site on 14<sup>th</sup> September 2020 and drilled the second borehole in the position identified as "Option 2" in the aerial image shown earlier in this report. The specification was the same as the first borehole.

On completion, once again, clearance and yield assessment pumping was initiated. The rest water level in the borehole was measured at ~5.30m below ground level. When the pump was activated, the site team recorded flows of approximately between 3.0 - 3.3 l/sec. This was an improvement in achievable flows realised from the first borehole.

There is some conflicting information recorded in the PDL report referencing water levels for BH 2. Initially, PDL advise a rest water level of 5.30m below ground level and a drawdown in water levels of 1.20m to approximately 6.50m below ground level then after more pumping, the flow was approximately the same but the borehole displayed a higher standing water level of 4.80m and a pumping water level of 8.40m - a drawdown of 3.80m. If the project was to progress then these figures would need to be interrogated but these reported anomalies do not change the fact that flow rates are much lower than hoped.

During the continued development pumping of BH 2 it was noted by the site team that sand was being discharged with the water - something not seen in BH 1. Imhoff cones were used to measure sand content and to identify whether the ingress was decreasing with time. After intermittent pumping of BH 2 at between 3.0 - 3.3 l/sec for the rest of the day and part of the following day, it was clear that the sand ingress was continuing to be seen. Samples of the sand were taken and particle content levels recorded by the use of the Imhoff cones. The imhoff cones identified varying levels of sand content ranging from 150ml/litre ( advised verbally in pump start up ) to a continuous ingress at varying concentrations which were documented by PDL in a table.

See sand concentration table and images below extracted from the PDL factual report ( appended ).

17/09/2020 14:00



Discharge to ground after 6 minutes



The below table shows the imhoff cone spot checks carried out on the discharge of water from BH 2.

Date and Time	Comment	Imhoff Cone reading (ml/L)
16/09/2020 14:00	Pump at base	42
16/09/2020 15:32	Pump at base	28
16/09/2020 16:20	Pump at base	16
17/09/2020 08:30	Pump at base	42
17/09/2020 11:52	Pump at base	31
17/09/2020 14:00	Pump at 8 m	10
17/09/2020 15:06	Pump at 8 m	15
17/09/2020 15:16	Pump at 8.5 m	22

The site team advised that sand appeared to be particularly fine with a particle size measurement estimated to be less than 0.5mm ( 500 micron ). The image below shows the ingested sand on the left of the plate and the 0.5mm - 1mm graded sand on the right.



*Comparison of sand discharged from BH2 (left) with a 0.5 mm to 1.0mm graded sand (right)*



## Conclusions & Recommendations

We conclude that test drilling has shown that the maximum flow rate that may be achieved using BH 1 as an abstraction borehole may be approximately 1.6 - 1.8 l/sec. BH 2 exhibits higher flow rates of perhaps 3 - 3.3 l/sec but sand ingress is being experienced.

The sand infestation seen in BH 2 would mean that a very high level of maintenance would be required to allow the system to continue operating. Mobilisation of sand would have a profound detrimental effect on mechanical plant, especially pumps, reducing lifespan considerably and elevating maintenance costs. Tasks would also see very frequent filter attention ( perhaps daily ) and ongoing disposal of accumulated sediment to a licenced waste unit. The other concern with continued sand mobilisation is the potential for some form of subsidence to be realised through extraction of sand from the sub-strata over the longer term.

With the sand infestation being so fine, in our opinion, there would be little chance of successfully screening this particulate out whilst maintaining a reasonable amount of open area ( slots ), something which would be required to allow reasonable amounts of water to access the inside of the borehole casings to abstract. There is adequate space within the existing borehole screens to install an additional well screen.

Although a Particle Size Distribution analysis has not been formally carried out, it is obvious that the sand being mobilised is generally less than 0.5mm and a screen slot of something like 0.4mm would be required. Wellscreen using this size slot would see an open-area of only 5% ( 2mm slot = 20% ) and this would inhibit water ingress into the bore and further compromise yield capacity and furthermore, there is no guarantee that all fines would be eradicated. Some could still enter the borehole and add to maintenance intensity. Hence the decision to employ a 2mm slot for the well screen - to offer the best chance of obtaining reasonable flow rates from the RTD.

Options open for the project now are;

- Carry out PSD analysis on the sand content mobilised and introduce secondary well screen with much smaller slots ( less than 0.5mm ) and re-test the borehole to check for sand mobilisation along with the achieved degree of arrest and determine new yield capability. Additional screening would see a further drop in yield achievement on BH 2 and there is no guarantee that this action would fully eradicate fine sand ingress.
- Utilise BH1 as the abstraction borehole as was the original intention and operate the system at flow rates of between 1.6 / 1.8 l/sec and discharge water to BH 2 . There is a strong possibility that BH2 will still require the secondary well screen and sand pack to maintain / prolong the borehole inner cavity. Additional boreholes would be required to achieve additional flow.
- Abandon the RTD boreholes and investigate the potential for the scheme to be serviced by groundwater held within the Upper Chalk horizon
- Abandon groundwater scheme entirely

Our recommendation is that the remainder of the open loop drilling and testing operation within the River Terrace Deposits is aborted due to low flow and sand ingress issues. Whilst there are measures that may be introduced to reduce sand ingress ( additional screening etc ) there will be no guarantee of success and yield availability will be further compromised and as a result, other options should be considered to service the facility heating system.

As discussed, open loop boreholes may still be an option if the Upper Chalk aquifer were to be tested. There would be a higher degree of confidence that boreholes accessing the Upper Chalk would gain higher volumes of water and importantly, without the risk of sand infestation from the River Terrace Deposits. Further investigation into the Upper Chalk aquifer would be required if this option was to be progressed.

END

\*\*\*\*\*

## **APPENDIX 1 – Project Dewatering Ltd - Development & Yield Test Pumping Report**



**Project:** Ernst Dence Estate, Greenwich  
**Client:** Royal Borough of Greenwich Council  
**Project No:** P724

### Notes on BH2 well-development

#### Background:

BH2 was drilled between 08 September and 14 September 2020 by cable percussion techniques. The bore diameter was 508 mm and a 330x301 mm PVC screen and liner was installed. The screen has a slot size of 2mm through the Sand and Gravel deposits with a 2 mm to 6 mm washed gravel filter pack. The specification of the borehole was identical to that of BH1 previously drilled on the site, which produced circa 1.6 to 1.8 l/sec of water with no observable fines content in the discharge when monitored by an Imhoff cone. At BH2 the base of the Sand and Gravels was proven at 9.2 m by probing at 8" diameter.

During extensive well development of BH2 on 16<sup>th</sup> and 17<sup>th</sup> September 2020 by intermittent pumping with a submersible drainage pump, significant sand ingress was observed into the borehole. Development of well continued to determine whether the sand content of the discharge continued to reduced. When pumping from the base of the borehole sand content was higher than when the pump inlet was lifted by approximately 1.0 m. However, with the pump higher than the borehole base it was observed that sand was settling at the base of the well causing reduction in depth from 9.0 to 8.6 m.

The flowrate achieved from the borehole was approximately 3.3 l/sec for the short pumping periods undertaken. The water level reduced from 5.3 mbgl to 6.5 mbgl during pumping according to the datalogger data collected.



*BH2 during well development*

**Borehole Soil Samples:**

**3 m**



**4 m**



**5 m**



**6 m**



**7 m**



**8 m**



**9 m**



**10 m**



**11 m**



Borehole drilled to 9.2 m at 500 mm diameter; generally fine to coarse sandy Gravel with a much higher proportion of sand in the 6 m sample.

Borehole drilled from 9.2 m to 11.5 m at 200 mm to prove clay layer.



**Sand Content:**

*Results from sand monitoring during development:*

<b>Date and Time</b>	<b>Comment</b>	<b>Imhoff Cone reading (ml/L)</b>
16/09/2020 14:00	Pump at base	42
16/09/2020 15:32	Pump at base	28
16/09/2020 16:20	Pump at base	16
17/09/2020 08:30	Pump at base	42
17/09/2020 11:52	Pump at base	31
17/09/2020 14:00	Pump at 8 m	10
17/09/2020 15:06	Pump at 8 m	15
17/09/2020 15:16	Pump at 8.5 m	22

*Initial discharge - 16/09/2020*



*After settling – 16/09/2020*



*17/09/2020 14:00*



*17/09/2020 15:00*



*Discharge to ground after 6 minutes*



*Sand discharged from BH2*



Sand appears to be approx 0.5 mm diameter and tests show would pass through a 1 mm slotted screen. A sample has kept for PSD analysis if required. The sand appears finer in comparison to a factory graded 0.5 to 1.0mm filter sand (see below).



*Comparison of sand discharged from BH2 (left) with a 0.5 mm to 1.0mm graded sand (right)*

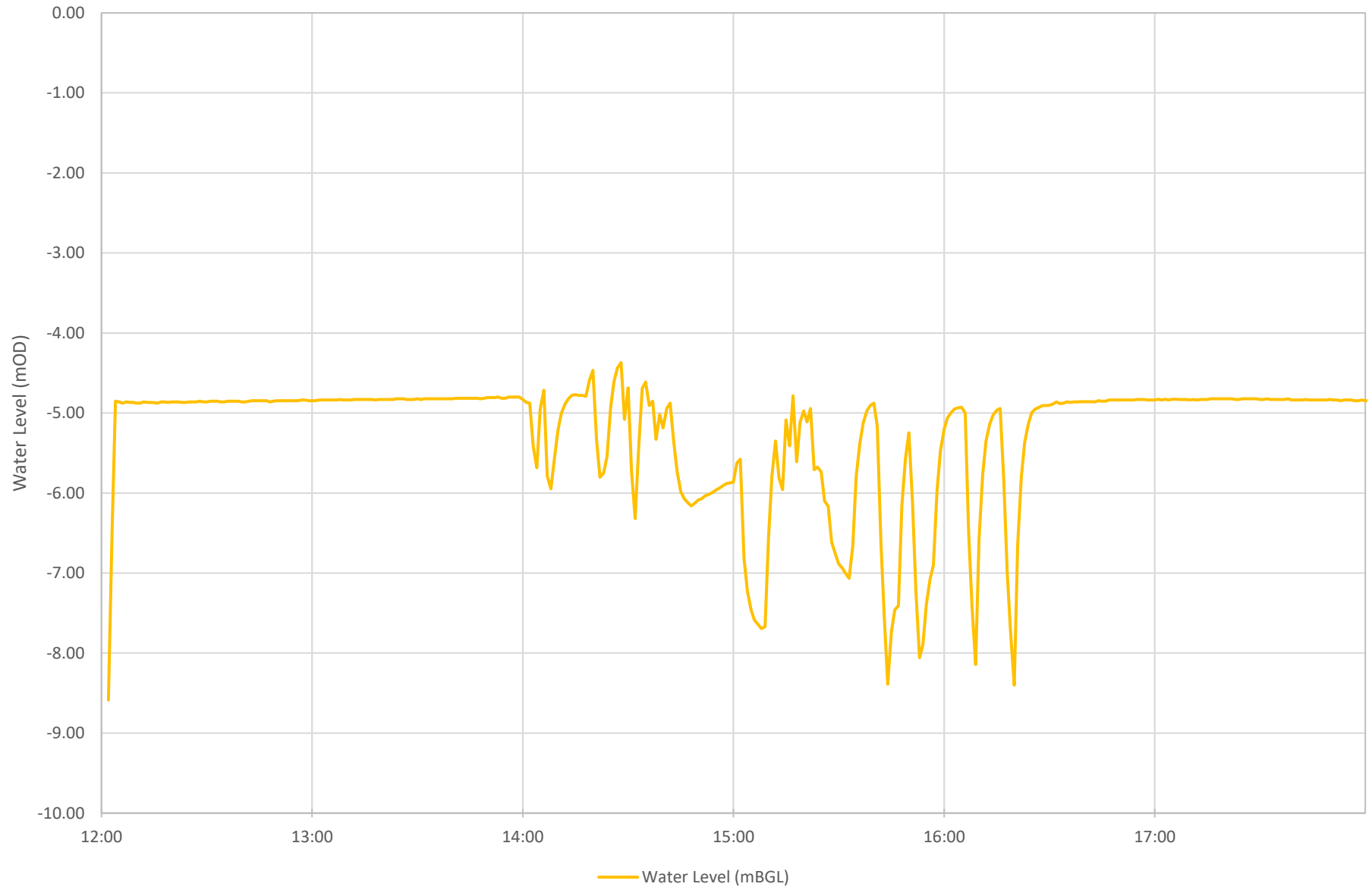


**Flow and drawdown data summary:**

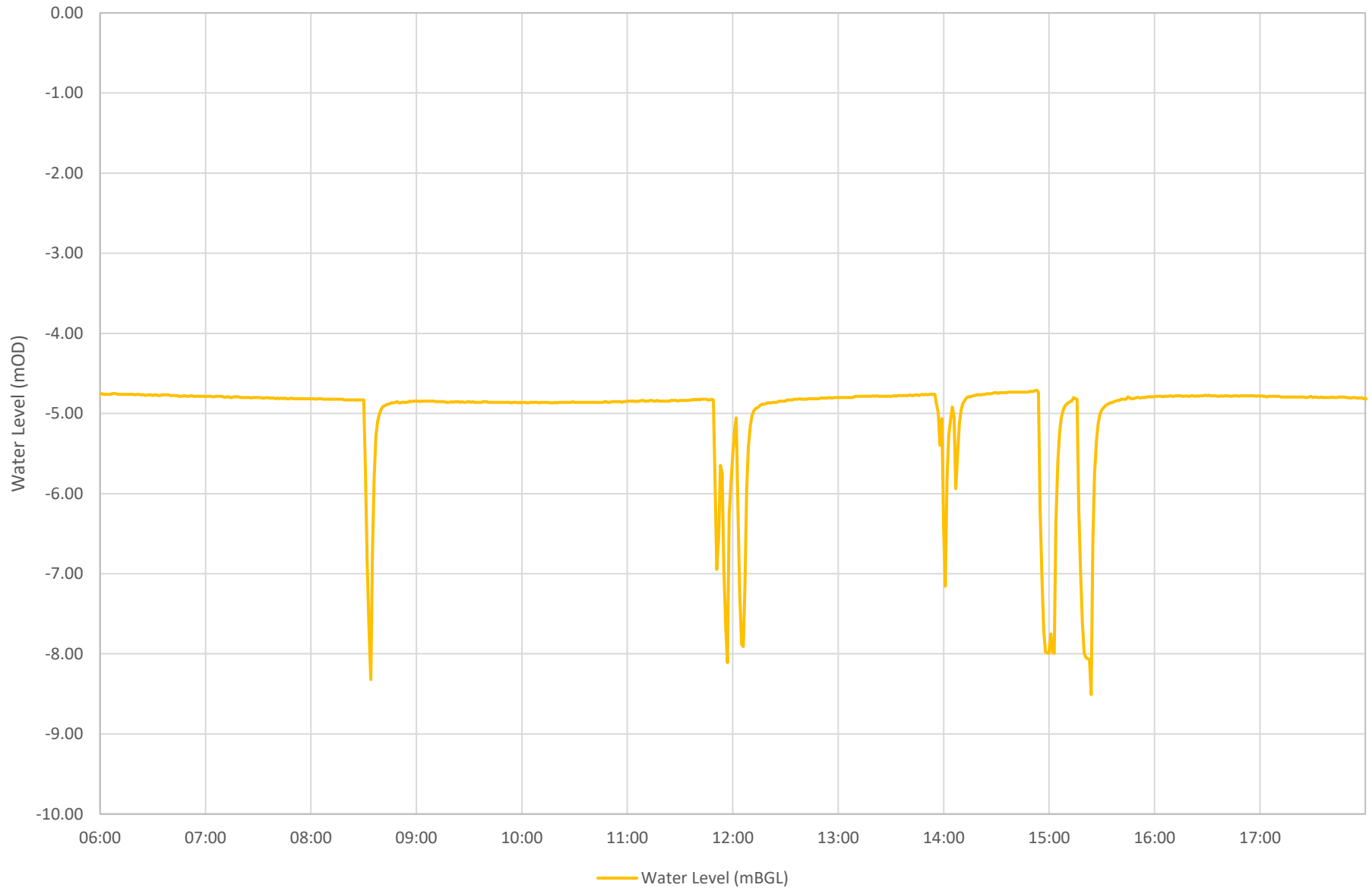
Due to the quantity of sand within the discharge from the borehole, a continuous pumping test could not be carried out. The pump flowrate was monitored during development using a mechanical turbine flowmeter, with flowrate manually recorded as between 3.0 and 3.3 l/sec during most pumping periods. During initial pumping on 16<sup>th</sup> September, the flowrate was lower due to clogging of the pump intake with sand, after which the pump was removed, cleaned and reinstalled.

Due to the short pumping periods, the long-term flow capacity of the borehole has not been established; almost certainly this is less than the 3.3 l/sec achieved during development. Water level was drawn to approximately 8.4 mbgl at this flowrate from a standing water level of 4.8 mbgl. Graphs of the water level from BH2 are attached.

BH2 Water Level Data 16/09/2020



BH2 Water Level Data 17/09/2020



Cable Percussion Boring  
 West Acres House, Pennyfine Road, Sunniside,  
 Newcastle upon Tyne NE16 5ER. Email : tqdltd@live.co.uk  
 Tel:(0191) 4889588 Mobile: 07828 721 913/07402 870 400

LOCATION: <i>ASTLEY STREET</i>	DAY: <i>Monday</i>
JOB NUMBER:	DATE: <i>07/19/2020</i>
BOREHOLE NO:	RIG: <i>TQDS Dando 3000</i>
SHEET: <i>1</i> OF:	CREW: <i>SF KD</i>
ATH. NO.	ENERGY RATIO er %

DESCRIPTION OF STRATA					DEPTH to base of Strata m	SAMPLES							DEPTHS CASING WATER								
Soft/Firm/Stiff	Colour	Clayey Silty Sandy etc.	SOIL TYPE	Sand Bands Cobbles etc.		No Type	Penetration m		u blows	S.P.T./C.P.T. mms											
							From	To		0 to 75	75 to 150	150 to 225		225 to 300	300 to 375	375 to 450					
Start of days drilling																					
<p><i>mobilise rig to site</i></p> <p><i>mobilise equipment to site 8" + 20" equipment.</i></p> <p><i>Standing 8AM - 6PM</i></p> <p><i>unable to get on to BH position Due to parked cars.</i></p>																					
					End of days drilling																

SHOW SAMPLES THUS U Undisturbed; D Disturbed; B Bulk; W Water; S Standard Penetration Test; C Cone Penetration Test

CASING		
Size (mm)	From (m)	To (m)

WATER					
OBSERVATION	DATE	TIME	DEPTH	INFLOW	CASING

DELAYS/BAD ACCESS/HARD STRATA etc			
Cause	From (m)	To (m)	Time (hr)

SIGNATURES  
 Driller: *[Signature]* Client: *[Signature]*





**Cable Percussion Boring**  
 West Acres House, Pennyfine Road, Sunnyside,  
 Newcastle upon Tyne NE16 5ER. Email: tqdLtd@live.co.uk  
 Tel:(0191) 4889588 Mobile: 07828 721 913/07402 870 400

LOCATION: <i>EASTNEY STREET</i>	DAY: <i>Wednesday</i>
JOB NUMBER:	DATE: <i>9/9/2020</i>
BOREHOLE NO:	RIG: <i>TQDS Bando 3000</i>
SHEET: <i>3</i> OF:	CREW: <i>SF KD</i>
ATH. NO.	ENERGY RATIO er %

DESCRIPTION OF STRATA					DEPTH to base of Strata m	SAMPLES							DEPTHS									
Soft/Firm/Stiff	Colour	Clayey Silty Sandy etc.	SOIL TYPE	Sand Bands Cobbles etc.		No Type	Penetration m		u blows	S.P.T./C.P.T. mms						C A S I N G	W A T E R					
Loose/Dense	Fine/Coarse Medium						From	To		0 to 75	75 to 150	150 to 225	225 to 300	300 to 375	375 to 450							
		Start of days drilling			<i>2.00</i>																	
		<i>BROWN coarse sand &amp; gravel.</i>			<i>5.00</i>																	
<p><i>Standing 10.30AM - 6PM</i>  <i>Instructed to stop drilling due to silty water going down drains</i>  <i>Waiting for sand bags and skip for spoil.</i></p>																						
SHOW SAMPLES THUS					End of days drilling	<i>5.00</i>																

U Undisturbed; D Disturbed; B Bulk; W Water; S Standard Penetration Test; C Cone Penetration Test

CASING		
Size (mm)	From (m)	To (m)
<i>508</i>	<i>2.00</i>	<i>5.00</i>

WATER					
OBSERVATION	DATE	TIME	DEPTH	INFLOW	CASING
<i>Water added.</i>			<i>2.00</i>		

DELAYS/BAD ACCESS/HARD STRATA etc			
Cause	From (m)	To (m)	Time (hr)

SIGNATURES  
 Driller *S. Jones* Client *[Signature]*





**Tony Quinn  
Drilling Ltd**

**DAILY SITE REPORT**

**Cable Percussion Boring**  
West Acres House, Pennyfine Road, Sunnyside,  
Newcastle upon Tyne NE16 5ER. Email: tqdltd@live.co.uk  
Tel:(0191) 4889588 Mobile: 07828 721 913/07402 870 400

LOCATION: <u>EFFSINLEY STREET</u>	DAY: <u>Thursday</u>
JOB NUMBER:	DATE: <u>10/9/2020</u>
BOREHOLE NO:	RIG: <u>TQDS Dario 3000</u>
SHEET: <u>4</u> OF:	CREW: <u>SF KD.</u>
ATH. NO.	ENERGY RATIO er %

DESCRIPTION OF STRATA					DEPTH to base of Strata m	SAMPLES										DEPTHS						
Soft/Firm/Stiff	Colour	Clayey Silty Sandy etc.	SOIL TYPE	Sand Bands Cobbles etc.		No Type	Penetration m		u blows	S.P.T./C.P.T.						C A S I N G	W A T E R					
Loose/Dense	Fine/Coarse Medium						From	To		0 to 75	75 to 150	150 to 225	225 to 300	300 to 375	375 to 450			mms				
Start of days drilling																						
<p><i>Standing 8am - 6pm</i> <i>Waiting for skip for spoil</i> <i>And sand and sand bags</i> <i>to stop water and silty sand</i> <i>go in down the drains</i> <i>put sand bags and place</i> <i>around rig.</i></p>																						
					End of days drilling																	

SHOW SAMPLES THUS U Undisturbed; D Disturbed; B Bulk; W Water; S Standard Penetration Test; C Cone Penetration Test

CASING		
Size (mm)	From (m)	To (m)

WATER					
OBSERVATION	DATE	TIME	DEPTH	INFLOW	CASING

DELAYS/BAD ACCESS/HARD STRATA etc			
Cause	From (m)	To (m)	Time (hr)

SIGNATURES  
Driller: *[Signature]* Client: *[Signature]*

### Cable Percussion Boring

West Acres House, Pennyfine Road, Sunnyside,  
Newcastle upon Tyne NE16 5ER. Email : tqdLtd@live.co.uk  
Tel:(0191) 4889588 Mobile: 07828 721 913/07402 870 400

LOCATION: <u>ASTLEY STREET</u>	DAY: <u>Friday</u>
JOB NUMBER:	DATE: <u>11/9/2020</u>
BOREHOLE NO:	RIG: <u>TQD'S Jumbo 3000</u>
SHEET: <u>5</u> OF:	CREW: <u>SF KD</u>
ATH. NO.	ENERGY RATIO er %

DESCRIPTION OF STRATA					DEPTH to base of Strata m	SAMPLES										C A S I N G	W A T E R
Soft/Firm/Stiff	Colour	Clayey Silty Sandy etc.	SOIL TYPE	Sand Bands Cobbles etc.		No Type	Penetration m		u blows	S.P.T./C.P.T. mms							
Loose/Dense	Fine/Coarse Medium						From	To		0 to 75	75 to 150	150 to 225	225 to 300	300 to 375	375 to 450		
Start of days drilling					5.00												
Brown Coarse Sand & Gravel.					9.00												
B.H. Incomplete																	
End of days drilling					9.00												

U Undisturbed; D Disturbed; B Bulk; W Water; S Standard Penetration Test; C Cone Penetration Test

CASING		
Size (mm)	From (m)	To (m)
508	5.00	9.00

WATER					
OBSERVATION	DATE	TIME	DEPTH	INFLOW	CASING
Water level 50.5.			5.00	dry	500
Water added.				5M	
Water STRIKE.			6.50	4.30	6.40

DELAYS/BAD ACCESS/HARD STRATA etc			
Cause	From (m)	To (m)	Time (hr)
Monitor WATER STRIKE.			0.20 min

SIGNATURES  
Driller: [Signature] Client: \_\_\_\_\_





**Tony Quinn  
Drilling Ltd**

**DAILY SITE REPORT**

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West Acres House, Pennyfine Road, Sunnyside,  
Newcastle upon Tyne NE16 5ER. Email: tqdltd@live.co.uk  
Tel: (0191) 4889588 Mobile: 07828 721 913/07402 870 400

LOCATION: <u>EASTNEY STREET.</u>	DAY: <u>Monday</u>
JOB NUMBER:	DATE: <u>14/9/20</u>
BOREHOLE NO:	RIG: <u>TQDS Dando 3000</u>
SHEET: OF:	CREW: <u>SF KD.</u>
ATH. NO.	ENERGY RATIO er %

DESCRIPTION OF STRATA				DEPTH to base of Strata m	SAMPLES							DEPTHS					
Soft/Firm/Stiff	Colour	Clayey Silty Sandy etc.	SOIL TYPE		Sand Bands Cobbles etc.	No Type	Penetration m		u blows	S.P.T./C.P.T.						C A S I N G	W A T E R
							From	To		mms							
Loose/Dense	Fine/Coarse Medium								0 to 75	75 to 150	150 to 225	225 to 300	300 to 375	375 to 450			
		Start of days drilling		9.00													
		<u>Sand &amp; GRAVEL.</u>		9.20													
		Soft-firm Reddish Brown Grey Woollen & Remoulding clay		11.00													
		firm Grey Sandy clay.		11.50													
		Instead of casing and continue drilling to final base of GRAVEL.		11.50													
SHOW SAMPLES THUS				End of days drilling													

U Undisturbed; D Disturbed; B Bulk; W Water; S Standard Penetration Test; C Cone Penetration Test

CASING		
Size (mm)	From (m)	To (m)
<u>508</u>	<u>9.00</u>	<u>9.00</u>
<u>200</u>	<u>9.00</u>	<u>11.50</u>

WATER					
OBSERVATION	DATE	TIME	DEPTH	INFLOW	CASING
<u>Water level 5.05</u>			<u>9.00</u>	<u>4.20</u>	<u>9.00</u>

DELAYS/BAD ACCESS/HARD STRATA etc			
Cause	From (m)	To (m)	Time (hr)

SIGNATURES

Driller

[Signature]

Client

[Signature]



**Tony Quinn  
Drilling Ltd**

**Cable Percussion Boring**

West Acres House, Pennyfine Road, Sunnyside,  
Newcastle upon Tyne NE16 5ER. Email : tqdLtd@live.co.uk  
Tel:(0191) 4889588 Mobile: 07828 721 913/07402 870 400

**DAILY SITE REPORT**

LOCATION: <i>Eastney Street.</i>	DAY: <i>Monday</i>
JOB NUMBER:	DATE: <i>14/9/2026</i>
BOREHOLE NO:	RIG: <i>TQD 5 Dando 3000</i>
SHEET: OF:	CREW: <i>SP LCD.</i>
ATH. NO.	ENERGY RATIO er %

DESCRIPTION OF STRATA					DEPTH to base of Strata m	SAMPLES							DEPTHS C A S I N G	W A T E R								
Soft/Firm/Stiff	Colour	Clayey Silty Sandy etc.	SOIL TYPE	Sand Bands Cobbles etc.		No Type	Penetration m		u blows	S.P.T./C.P.T. mms												
Loose/Dense	Fine/Coarse Medium						From	To		0 to 75	75 to 150	150 to 225			225 to 300	300 to 375	375 to 450					
Start of days drilling																						
<p><i>Gr.</i> <i>Bentonite Seal.</i> <i>1.5m.</i> <i>filter pack</i> <i>9.00</i></p>																						
End of days drilling																						

SHOW SAMPLES THUS U Undisturbed; D Disturbed; B Bulk; W Water; S Standard Penetration Test; C Cone Penetration Test

CASING		
Size (mm)	From (m)	To (m)

WATER					
OBSERVATION	DATE	TIME	DEPTH	INFLOW	CASING

DELAYS/BAD ACCESS/HARD STRATA etc			
Cause	From (m)	To (m)	Time (hr)
<i>Install Well 300mm</i>			<i>3 hrs</i>

SIGNATURES  
Driller: *[Signature]* Client: *[Signature]*

WHITE / YELLOW / PINK



**Cable Percussion Boring**  
 West Acres House, Pennyfine Road, Sunnyside,  
 Newcastle upon Tyne NE16 5ER. Email: tqdltd@live.co.uk  
 Tel: (0191) 4889588 Mobile: 07828 721 913/07402 870 400

LOCATION: <u>EASTNEY STREET</u>	DAY: <u>Tuesday</u>
JOB NUMBER:	DATE: <u>15/9/2020</u>
BOREHOLE NO:	RIG: <u>TQDS Dado 3000</u>
SHEET: OF:	CREW: <u>SF KD</u>
ATH. NO.	ENERGY RATIO er %

DESCRIPTION OF STRATA					DEPTH to base of Strata m	SAMPLES							DEPTHS CASING	WATER					
Soft/Firm/Stiff	Colour	Clayey Silty Sandy etc.	SOIL TYPE	Sand Bands Cobbles etc.		No Type	Penetration m		u blows	S.P.T./C.P.T. mms									
Loose/Dense	Fine/Coarse Medium						From	To		0 to 75	75 to 150	150 to 225			225 to 300	300 to 375	375 to 450		
Start of days drilling																			
<p><i>DAY WORKS. 8AM - 6PM</i>  <i>finish off well. Installation</i>  <i>clean up spoil from</i>  <i>around BH and tidy up.</i></p>																			
					End of days drilling														

SHOW SAMPLES THUS: U Undisturbed; D Disturbed; B Bulk; W Water; S Standard Penetration Test; C Cone Penetration Test

CASING		
Size (mm)	From (m)	To (m)

WATER					
OBSERVATION	DATE	TIME	DEPTH	INFLOW	CASING

DELAYS/BAD ACCESS/HARD STRATA etc			
Cause	From (m)	To (m)	Time (hr)

SIGNATURES  
 Driller: *[Signature]* Client: *[Signature]*



**Tony Quinn  
Drilling Ltd**

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**DAILY SITE REPORT**

LOCATION: <i>EASTREY STREET</i>	DAY: <i>Wednesday</i>
JOB NUMBER:	DATE: <i>16/9/2020</i>
BOREHOLE NO:	RIG: <i>TQD S Dario 3000</i>
SHEET: OF:	CREW: <i>SF KD</i>
ATH. NO.	ENERGY RATIO er %

DESCRIPTION OF STRATA					DEPTH to base of Strata m	SAMPLES							DEPTHS C A S I N G		W A T E R						
Soft/Firm/Stiff	Colour	Clayey Silty Sandy etc.	SOIL TYPE	Sand Bands Cobbles etc.		No Type	Penetration m		u blows	S.P.T./C.P.T. mms											
Loose/Dense	Fine/Coarse Medium						From	To		0 to 75	75 to 150	150 to 225	225 to 300	300 to 375		375 to 450					
Start of days drilling																					
<p><i>Standing 8AM - 11PM</i> <i>Waiting for Skip to be</i> <i>moved or Parked cars</i> <i>to move to get rig</i> <i>off Bn. position</i></p>																					
					End of days drilling																

SHOW SAMPLES THUS

U Undisturbed; D Disturbed; B Bulk; W Water; S Standard Penetration Test; C Cone Penetration Test

CASING		
Size (mm)	From (m)	To (m)

WATER					
OBSERVATION	DATE	TIME	DEPTH	INFLOW	CASING

DELAYS/BAD ACCESS/HARD STRATA etc			
Cause	From (m)	To (m)	Time (hr)

SIGNATURES  
 Driller *[Signature]* Client *[Signature]*