

---

# BOREHOLE WATER ASSOCIATION OF SOUTHERN AFRICA



## 2020 MEMBERSHIP CERTIFICATE

*Valid from 1 January 2020 to 31 January 2021*

*This is to certify that*

***Arena Group***

*has been a member of the Association since*

**December 2015**

*and has pledged to abide by the constitution and rules of the Association as well as to comply with the SABS Standards for borehole construction – SANS 10299: 2003 Development, Maintenance and Management of Ground Water Resources.*

### **MISSION STATEMENT**

*To protect Southern Africa's ground water resources, so as to maximise the long- and short- term utilization thereof, thereby guaranteeing its dependability as a water resource for the community at large while protecting the industry's economic future.*

Membership Number: 099

President: *Colin Rice*

Certificate Number: 2020/042

Secretary: *L'aura James*

---



## BOREHOLE YIELD TEST REQUIREMENTS

The South African National Standard for the test pumping of water boreholes (SANS 10299-4:2003) clearly prescribes how the testing is to be carried out.

Remember the Department of Water and Sanitation (DWS) will only authorize groundwater use if the above method is used.

[This spreadsheet](#) provides a template for the data capture.

Here is a summary of the specifications for test-pumping of boreholes.

### The test would need to include:

#### Step-drawdown Test:

4 to 6 x 1-hour steps, each at a different rate – incrementally increasing  
During the last step try to draw the water level down to the pump depth.  
The yields to use for the steps are:

- Step1 – One third of the expected yield
- Step2 – two-thirds of the expected yield
- Step3 – equal to the expected yield
- Step4 – one and a half times the expected yield

The planned steps can be adjusted during the test, although the yield during the individual steps must be constant. Yield must be measured at least 3 times during the test to ensure it is constant.

Recovery of the water level after the step test should be monitored till the water level recovers to ~ 1 m hours of the Static water level or for ~ 12 hours.

#### Constant Discharge Test:

24 - 72 hours at a constant rate

If the water level is drawn down to pump inlet during the Test the pump must be stopped immediately, and recovery of the water level monitored.

The constancy of the yield is very important, otherwise the data cannot be analyzed.

The Water level measurements should be taken and recorded according the attached spreadsheet.

#### Recovery Test:

Immediately after the pump is turned off after the pumping test, start measuring water levels.  
Measure Recovery until:

- Water levels recover to less than 5 % of the total drawdown during the constant discharge test
- At least three readings taken in succession are identical
- A time equal to the total time taken for the Constant Discharge Test has

elapsed the **data** that needs to be collected includes:

- Data and time at commencement of Test
- The Static Water level at the start of the test
- The depth of the borehole
- The distance from the borehole to observation boreholes (if applicable)
- Pump installation depth
- Water strike depths (if known from drilling/landowner)
- Borehole diameter
- Rainfall (if it rains during the test)
- Drawdown of the water level
- Rate of discharge (for Steps and constant Tests)
- Attached spreadsheets show measurement intervals and required info.

### **Pump:**

- Pump must have suitable power drive and have the correct pumping capacity. Needs to be managed properly!
- It is VERY IMPORTANT that the pumping rate is CONSTANT during the individual steps and the constant discharge test. The mathematic equations used for analyzing the data are only valid if the flow is constant! If the variation in the pump yield exceeds 5 % the test must be stopped, water levels allowed to recover, and the test restarted using suitable equipment!  
Valves and flow gauges are needed to monitor and control the flow rates as during pumping the change in head results in the pump yield changing.
- Pump inlet must be at the main water strike. If this is not known, install the pump 3 – 5 m from the bottom of the hole.
- Pump must have a non-return valve to ensure water doesn't flow back into the borehole
- Flow can be measured using:
  - Bucket of known volume and stopwatch (most reliable, and should be used to check other methods)
  - Flow meter (note that if using a flow meter, it will only work when the discharge pipe is full and the flow is not turbulent)
  - Orifice weir
  - V-notch weir

### **Observation Boreholes:**

Boreholes close by should have their water levels monitored during the Test. Boreholes in the area should be rested for at least a day before pumping

### **Discharge pipeline:**

Water from the borehole must be piped 50 – 100 m down gradient from the borehole so that it does not recharge and affect the test



**BOREHOLE TEST: TERMS & CONDITIONS**

**TEST PRICING STRUCTURE**

Travelling cost to location.

- All test Rig Diesel to be supplied by client or arranged with Arena Pumps.
- Before the test can commence the borehole will be handed over to Arena in good order by the owner.
- The test prices below are only for holes up to 120m any Borehole deeper than 120m will be quoted formally.
- If the pump gets stuck during the lowering procedure the operator will inform the owner.
- If requested to continue the lowering process by the client and any damages occur RE: Borehole wall collapses or the pump gets stuck, the client will be held liable for the costs of any damages on the equipment / borehole.
- Any delay costs caused by the pump getting stuck and/or any scenario not caused by Arena Pumps, the client will be held liable for additional costs.
- Delay costs will be charged at hourly rate, does not include the test period and applies to faulty boreholes only.
- Standby time due to rain and heavy winds charged at hourly rate.
- If Arena Pumps suspect any faults, we will recommend a camera inspection to confirm any faults.
- If the hole cant be tested due to a dry hole or obstacle the minimum charge for rigging and site establishment will be R3500 ex vat

**CAMERA INSPECTION COSTS (Listed on the pricing graph)**

Standard cost.

- Travelling cost.
- Labour cost for report, NO longer than 2 hours per hole.

Please tick relevant boxes below.

**NB please note that the removal of equipment, lowering and extraction are charged at R 395.00 per hour**

BIG TEST RIG	STEP DRAW TEST	ROLL RIG TEST	RECOVERY OF WELL AFTER TEST	STANDING TIME	CAMERA INSPECTION	WATER SAMPLES
1000 – 110 000 lit/HOUR 0 – 120m 120 – 200m Quote on request		0 - 15 000 litres 0 - 120m 120 - 200m Quote on request		RAIN/WIND		
<input type="checkbox"/> <b>12 HOUR TEST</b> R5 740 <input type="checkbox"/> <b>24 HOUR TEST</b> R9 480 <input type="checkbox"/> <b>48 HOUR TEST</b> R18 960 <input type="checkbox"/> <b>72 HOUR TEST</b> R28 440  EXCLUDING: Transport and Diesel for machines	R350 FOR EACH HOUR  MAXIMUM OF 5 STEPS  <input type="checkbox"/> STEP DRAW RECOVERY  @R200/H  Excluding Diesel	<input type="checkbox"/> <b>6 HOURS</b> R4 150 <input type="checkbox"/> <b>8 HOURS</b> R5 050 <input type="checkbox"/> <b>12 HOURS</b> R5 740 <input type="checkbox"/> <b>24 HOURS</b> R9 480 <input type="checkbox"/> <b>48 HOURS</b> R18 960 <input type="checkbox"/> <b>72 HOURS</b> R28 440  EXCLUDING: Transport and Diesel for machines	<input type="checkbox"/> @R200/H	<input type="checkbox"/> R185/H ONLY DURING WORKING HOURS: 07H00 to 17H00.	<input type="checkbox"/> STANDARD COST UP TO 150m R2 800  <input type="checkbox"/> 150m TO 200m @R3 500  <input type="checkbox"/> 200m TO 300m @R4 500	<input type="checkbox"/> Water Sample Test R1 450  <input type="checkbox"/> Water sample drawn for client R85 client to do own test and supplies own bottle  <input checked="" type="checkbox"/> Borehole registration cost R 1500-3500  <input checked="" type="checkbox"/> Borehole license quoted optional

\*All test result includes a borehole test certificate

\*Prices are all exclusive of VAT

CLIENT: \_\_\_\_\_ SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

CONTACT NO OF CLIENT: \_\_\_\_\_ TECHNICIAN: \_\_\_\_\_

# BOREHOLE TESTING

## MEASUREMENTS AND SAMPLES

BOREHOLE NO: \_\_\_\_\_

COORDINATES: S \_\_\_\_\_

OPERATOR: \_\_\_\_\_

E \_\_\_\_\_

DATE: \_\_\_\_\_

INTERVALS	MEASUREMENTS TO BE TAKEN			
<b>STEP DRAW TESTING</b>		EC (ELEC CONDUCTIVITY)	PH	TEMP
BEGINNING OF STEPDRAW TESTS				
END OF STEP DRAW TESTS				
<b>CONSTANT DISCHARGE TESTING</b>				
START OF 72 HOUR TEST				
AFTER 6 HOURS				
AFTER 12 HOURS				
AFTER 18 HOURS				
AFTER 24 HOURS				
AFTER 30 HOURS				
AFTER 36 HOURS				
AFTER 42 HOURS				
AFTER 48 HOURS				
AFTER 54 HOURS				
AFTER 60 HOURS				
AFTER 72 HOURS				

WATERSAMPLES:

4 X 1L SAMPLES AT END OF CONSTANT DISCHARGE  
MARK CLEARLY WITH PERMANENT MARKER ON 2 SIDES

<p><b>BOREHOLE NUMBER</b></p> <p><b>DATE</b></p> <p><b>TIME</b></p>
---

S: \_\_\_\_\_

BOREHOLE TEST RECORD SHEET

E: \_\_\_\_\_

BOREHOLE NO: \_\_\_\_\_  
 SITE NAME \_\_\_\_\_  
 CONTRACTOR: **ARENA GROUP** \_\_\_\_\_  
 SUPERVISOR: \_\_\_\_\_

BOREHOLE DEPTH: \_\_\_\_\_  
 WATER LEVEL (mbgl): \_\_\_\_\_  
 DEPTH OF PUMP: \_\_\_\_\_  
 TYPE OF PUMP: \_\_\_\_\_

**STEP TEST AND RECOVERY**

STEP 1		STEP 2		STEP 3		STEP 4		STEP 5	
TIME	DRAWDOWN	TIME	DRAWDOWN	TIME	DRAWDOWN	TIME	DRAWDOWN	TIME	DRAWDOWN
(min)	(m)	(min)	(m)	(min)	(m)	(min)	(m)	(min)	(m)
1		1		1		1		1	
2		2		2		2		2	
3		3		3		3		3	
4		4		4		4		4	
5		5		5		5		5	
6		6		6		6		6	
7		7		7		7		7	
9		9		9		9		9	
12		12		12		12		12	
15		15		15		15		15	
20		20		20		20		20	
25		25		25		25		25	
30		30		30		30		30	
40		40		40		40		40	
50		50		50		50		50	
60		60		60		60		60	

RECOVERY		RECOVERY		RECOVERY	
TIME	DRAWDOWN	TIME	DRAWDOWN	TIME	DRAWDOWN
(min)	(m)	(min)	(m)	(min)	(m)
1		160		560	
2		180		580	
3		200		600	
4		220		620	
5		240		640	
7		260		660	
9		280		680	
12		300		700	
15		320		720	
20		340			
25		360			
30		380			
40		400			
50		420			
60		440			
70		460			
80		480			
90		500			
100		540			

## Form 5 F

### Constant Discharge test and recovery

#### Borehole Test Record Sheet

Project no.		 <p style="font-size: small;">Tel: 086 999 0823 - (044) 050 1151 Fax: (044) 050 1152 Corner of Rand &amp; Bank street - George, 6529 REG: 2016/423870/07 VAT: 4650275557</p>	Province	
Borehole No			District	
Borehole Depth			Co-ordinates	
Water level (mbgl)				
Depth of pump			Existing pump	
Height of casing			Contractor	
Elevation		Info@arenagroup.co.za	Pump Type	

### Constant Discharge test and recovery

Test started			Test completed			Duration							
Date		Time	Date & Time							Hours			
Distance between discharge and observation holes in m						Observation Borehole							
						Distance from pumping hole							
Discharge borehole						Recovery Rate				Observation Hole			
Time	Drawdown	Yield	Time	Drawdown	Yield	Time	Drawdown	Time	Drawdown	Time	Drawdown	Time	Drawdown
(min)	(m)	(L/S)	(min)	(m)	(L/S)	(min)	(m)	(min)	(m)	(min)	(m)	(min)	(m)
1			780			1	780			1	780		
2			840			2	840			2	840		
3			960			3	960			3	960		
4			1080			4	1080			4	1080		
5			1200			5	1200			5	1200		
7			1320			7	1320			7	1320		
9			1440			9	1440			9	1440		
12			1560			12	1560			12	1560		
15			1680			15	1680			15	1680		
20			1800			20	1800			20	1800		
25			1920			25	1920			25	1920		
30			2040			30	2040			30	2040		
40			2160			40	2160			40	2160		
50			2280			50	2280			50	2280		
60			2400			60	2400			60	2400		
70			2520			70	2520			70	2520		
80			2640			80	2640			80	2640		
90			2760			90	2760			90	2760		
120			2880			120	2880			120	2880		
150			3000			150	3000			150	3000		
180			3120			180	3120			180	3120		
210			3240			210	3240			210	3240		
240			3360			240	3360			240	3360		
270			3480			270	3480			270	3480		
300			3600			300	3600			300	3600		
360			3720			360	3720			360	3720		
420			3840			420	3840			420	3840		
480			3960			480	3960			480	3960		
540			4080			540	4080			540	4080		
600			4200			600	4200			600	4200		
660			4320			660	4320			660	4320		
720						720				720			

Comment on recovery rate (%)

Temperature		°C
EC		ms/cm