BETTERLINE WATER LTD
Water Pumps, Irrigation, Solar Equipment, Generators,
Boreholes, Swimming Pools and Water Treatment
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REPORT ON BOREHOLE TEST PUMPING

CLIENT:PARDAMAT COMPREHENSIVE SCHOOL

BOREHOLE NAME & LOCATION: PARDAMAT BOREHOLE

Testing Contractor: BETTERLINE WATER LIMITED

Compiled by

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GLOSSARY OF TERMS

Aquifer: A geological formation or structure, which stores and transmits water and which is able to supply water to wells, boreholes or springs to satisfy a particular water demand.

Aquifer characteristics: Ability of the aquifer to store and transmit ground water

Confined aquifer: Are those aquifers in which the piezometric level is higher than the elevation at which the aquifer was encountered. Static water levels are higher than the top of the formations.

Drawdown: The distance between the static water level and the pumped water level.

Hydro geological: Those factors that deal with subsurface water and related geological aspects of surface water

Pumping Water Level: The level at which water stands in a well when pumping is in progress, this is also called the dynamic water level when measured as measured in the well.

Recharge: General term applied to the passage of water from surface or subsurface sources (e.g. rivers, rainfall, and lateral ground water flow) to the aquifer zones.

Recovery: Return to static water level following abstraction of groundwater.

Residual Drawdown: During water level recovery, the distance between pumped water level and the static water level.

Semi-confined aquifer: An aquifer partially confined by soil layers of low permeability through which recharge and discharge can still occur.

Specific Capacity: Ratio of pumping rate and drawdown ($m^3/hr/m$), a measure of the well performance.

Static Water Level: The level of water in a well that is not affected by abstraction of ground water.

Test Pumping: A test that is conducted to determine aquifer or well characteristics.

Transmissivity: A measure of the aquifer characteristics to conduct water through its saturated thickness (m^2/day)

Well Yield: Is the volume of water per unit of time discharged as litres or cubic metres from a well either by pumping or free flow.

Yield: Volume of water discharge from a well, usually in m^3/hr

INTRODUCTION

Getting an adequate supply of safe clean water has a great deal of advantages from ensuring availability of enough quantities by the client for various domestic processes, reducing health risks associated with insufficient water in the upcoming projects, to provision of reliable water.

Taking these into account, the client needing to know the quantity of production from his borehole contracted Test Pumping Unit to carry out a Test Pumping procedure, this is the report.

OBJECTIVES

1. To establish the borehole's potential by estimating the sustainable yield and hydraulic performance for water supply.
2. To collect a water sample for submission to a reputable laboratory for quality analysis.

CONCEPT

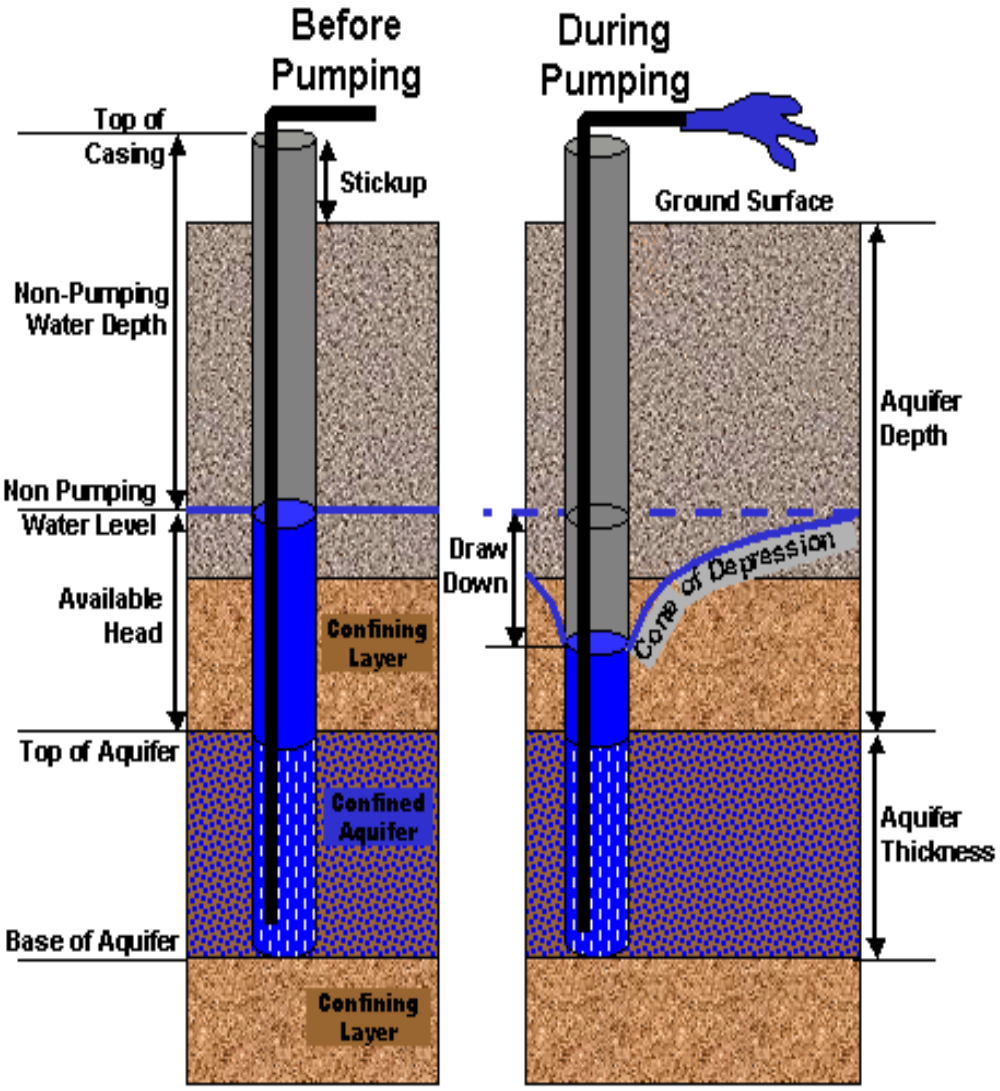
The test pumping consists of pumping the borehole at variable rates and recording the water level (and therefore the drawdown) in the pumping well, the Recovery rate is thereafter recorded with the pump now switched off.

Discharge Measurement and Recovery Measurements

Discharge measurement was done by an approved volumetric method. A calibrated container of 20litres capacity when full was used. When time to fill measurement is made, each discharge measurement is calculated from the average of three-time measurements. Discharge varies by no more than 15% across the constant discharge test. A globe valve was used to control the discharge as the case demanded. **See Discharge Drawdown Test data sheet.**

The recovery test is very useful in qualitatively assessing the pumping effect and possible dewatering of aquifers that may result due to the limited extent of an aquifer. Furthermore, the recovery test will indicate the level to which the aquifer is actually dewatered by measuring the residual drawdown after the borehole is allowed to recover.

PROCEDURE
TEST PUMPING CALIBRATION



Continuous Rate Test (CRT) for 24 Hours

25th JAN,2025.

The team lowered a **Submersible pump SP 2/48 Pump** and **1 1/2'' inches** GI pipes down to **186m.** The pump was powered by a generator **40KVA**. The Static Water Level was measured at **44.42m** before starting the test.

07:11:00 hours: Commenced testing. An average flow of **1.6 m³/hr**. was recorded during the test with the gate valve fully opened as was with respect to flow.

Recovery Test Measurements (RTM) After 1Hour

26th JAN, 2025.

07:10:00 hours: The RTM begun immediately after the CRT, when the pump was switched off. A total of **29.31%** recovery coefficient was recorded during the 60mins recovery test measurement. This resulted into residual drawdown **90.54m**. **See annexed Recovery data sheet**. The test unit was pulled out thereafter.

RESULTS AND ANALYSIS

Specific Yield/Specific Capacity (24 Hours)

A borehole Specific Capacity (an estimate of borehole transmissibility) is calculated as yield per meter of drawdown.

Using (**Driscoll, 1986**) formula

Specific capacity S = Q/s

=discharge per hour (m^3/hr)/ maximum drawdown (m) = (1.60/128.40)

=0.012461059m^3/hr/m

Table 1: Summary of bore hole and test data results

DETAILS/LOCATION	**PARDAMAT BOREHOLE**
Date drilled	Refer to drilling records.
Measured depth	200m.
Water Struck Levels	Refer to drilling records.
Date of Test	25th to 26th January, 2025
Static Water Level (SWL)	44.42m
Pump Intake Depth	186m
Pumping Water Level (PWL)	172.60m
Drawdown	128.40m
Average tested Well Yield	1.60m^3/hr.
Duration of Test Pumping	24 Hours
Recovery Time	60mins
Recovery Coefficient	29.31%
Residual Drawdown	90.54m
Specific Capacity	**0.012461059m^3/hr/m**
Transmissivity	**0.364859813m^2/day**
Maximum safe design yield (Considering 70% of the average yield)	***1.12m^3/hr.***

Aquifer Transmissivity (T)

It is a measure of the aquifer characteristics to conduct water through its saturated thickness

By using (**Logan, 1964)** formula,

Transmissivity, T= 1.22 Q/s expressed in m^2/day: 1.22 is a constant,

Q is discharge per day and S is drawdown

=1.22 X (1.60 X 24)/128.40

=**0.364859813m^2/day**

Analysis of Ground Water Potential

With a Specific Capacity of an aquifer **0.012461059m^3/hr/m**,Transmissivity of **0.364859813m^2/day** and a recovery coefficient of **29.31%** .it is conclusive that the borehole is of poor recharge potential and is fed mainly from unconfined aquifers. The drilled well depth is assumed to have fully explored all the available upper aquifers in this geological set up.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. With a Specific Capacity of **0.012461059m^3/hr/m ,** and an aquifer Transmissivity of **0.364859813m^2/day ,** the borehole is of poor recharge potential.
2. The drilled depth in this hydro geological setup is assumed to have fully explored all the available upper aquifers in this geological setup.
3. The average tested well yield was **1.60m^3/hr.**

RECOMMENDATIONS

The following recommendations are made

1. The Design Yield considering **128.40** drop from the SWL during abstraction should be a maximum of **1.12m^3/hr.**
2. Abstraction should not exceed 10 hours a day, since over pumping would lead to the aquifer depletion.
3. The drop pipes used for lowering the pump into position should be of either class B GI or UPVC pipes with sufficient tensile strength to withstand the stresses and vibrations associated with pumping water.

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Well No:	**C**	***Total Depth of Well:***	**200M**
Contract:	**Borehole Testing Pumping**	***Depth of Pump Intake:***	**186M**
Client:	**PARDAMAT COMPREHENSIVE SCHOOL**	***Datum Level:***	**0.6**
Location:	**PARDAMAT**	***Pump Type:***	**SP 2/48**
Well Type:	**Drilled**	***Pipe Type &Size:***	**GI 1.5"**
Testing Contractor:	**Betterline Water Ltd**	***Power Source:***	**GENSET**
Static Water Level:	**44.42**	***Pumping Water Level:***	**172.6**

DISCHARGE DRAWDOWN TEST

Date	Time	Elapsed Time (min)	Water Level (m bdl)	Drawdown (m)	Yield (m3/hr)	EC (uS/cm)	Remarks
25.01.2025		0	44.20	0.00			**Start of constant discharge test**
	07:11:00	1	46.35	2.15	1.90		Grey
	07:12:00	2	47.52	3.32			
	07:13:00	3	47.87	3.67			
	07:14:00	4	48.74	4.54			
	07:15:00	5	49.85	5.65			
	07:16:00	6	51.34	7.14			
	07:17:00	7	52.35	8.15			
	07:18:00	8	53.57	9.37			
	07:19:00	9	54.78	10.58			
	07:20:00	10	56.02	11.82			
	07:22:00	12	57.31	13.11			
	07:24:00	14	59.71	15.51			
	07:26:00	16	61.70	17.50			
	07:28:00	18	63.43	19.23			
	07:30:00	20	65.13	20.93			
	07:35:00	25	68.70	24.50			
	07:40:00	30	73.03	28.83			
	07:45:00	35	76.42	32.22			
25.01.2025	07:50:00	40	80.27	36.07			
	07:55:00	45	84.51	40.31			
	08:00:00	50	88.14	43.94			
	08:05:00	55	91.69	47.49			
	08:10:00	60	96.20	52.00	1.60		
	08:25:00	75	99.20	55.00			
	08:40:00	90	100.35	56.15			
	08:55:00	105	101.25	57.05			
	09:10:00	120	104.26	60.06			
	09:40:00	150	112.10	67.90			
	10:10:00	180	114.28	70.08			
	10:40:00	210	119.40	75.20			Clear
	11:10:00	240	123.58	79.38			
	12:10:00	300	129.22	85.02			
	13:10:00	360	147.57	103.37			
	14:10:00	420	172.60	128.40			
	15:10:00	480					
	16:10:00	540					
	17:10:00	600					
	18:10:00	660					
	19:10:00	720					
	20:10:00	780					clear
	21:10:00	840					
	22:10:00	900					
	23:10:00	960					
	00:10:00	1020					
	01:10:00	1080					
	02:10:00	1140					
	03:10:00	1200					
	04:10:00	1260					
	05:10:00	1320					
	06:10:00	1380					Collected water sample for FCA
	07:10:00	1440					**End of drawdown test**

RECOVERY OF DISCHARGE DRAWDOWN TEST

Date	Time	Elapsed Time (min)	Water level (m bdl)	Residual Drawdown (m)	Recovery %	Remarks
26.01.2025	07:10:00	0	172.60	**0.00**	0.00%	**Start recovery observations**
	07:11:00	1	169.10	3.50	2.73%	
	07:12:00	2	168.72	3.88	3.02%	
	07:13:00	3	167.22	5.38	4.19%	
	07:14:00	4	166.32	6.28	4.89%	
	07:15:00	5	165.13	7.47	5.82%	
	07:16:00	6	164.56	8.04	6.26%	
	07:17:00	7	163.42	9.18	7.15%	
	07:18:00	8	162.87	9.73	7.58%	
	07:19:00	9	161.14	11.46	8.93%	
	07:20:00	10	160.49	12.11	9.43%	
	07:21:00	11	159.62	12.98	10.11%	
	07:22:00	12	158.19	14.41	11.22%	
	07:23:00	13	157.80	14.80	11.53%	
	07:24:00	14	156.14	16.46	12.82%	
	07:25:00	15	155.27	17.33	13.50%	
	07:26:00	16	154.38	18.22	14.19%	
	07:27:00	17	153.19	19.41	15.12%	
	07:28:00	18	152.90	19.70	15.34%	
	07:29:00	19	151.27	21.33	16.61%	
	07:30:00	20	150.47	22.13	17.24%	
	07:32:00	22	149.92	22.68	17.66%	
	07:34:00	24	149.46	23.14	18.02%	
	07:36:00	26	148.80	23.80	18.54%	
	07:38:00	28	148.20	24.40	19.00%	
	07:40:00	30	147.76	24.84	19.35%	
	07:45:00	35	145.10	27.50	21.42%	
	07:50:00	40	143.46	29.14	22.69%	
	07:55:00	45	141.40	31.20	24.30%	
	08:00:00	50	139.16	33.44	26.04%	
	08:05:00	55	137.25	35.35	27.53%	
	08:10:00	60	134.96	37.64	29.31%	**End of 1 hour Recovery**