



MAURITIUS RESEARCH COUNCIL
INNOVATION FOR TECHNOLOGY

**ENERGY AUDITING,
MANAGEMENT & EFFICIENCY AT
CWA PUMPING STATIONS**

Final Report - Phase II
*Comparison of Design Data
and Installed Equipment*

October 2006

MAURITIUS RESEARCH COUNCIL

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Project on

**ENERGY AUDITING, MANAGEMENT AND
EFFICIENCY**

AT

CWA PUMPING STATIONS

*Phase II: Comparison of Design Data and Installed
Equipment*

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October 2006

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M.A.H Domah

Abstract

This project on ‘Energy Auditing, Management and Efficiency at CWA Pumping Stations’ has been put forward in order to identify energy conservation opportunities aiming to have an optimized pumping system. It is divided into four distinct phases. **Phase 1** which has already been completed, included the gathering of data for computing the production cost at borehole pumping stations and estimating the energy wastage from a desktop study. As per the study of phase 1 of this project, the average production cost based on years 2001, 2002 and 2003. shows the production cost at approximately Rs 0.65 / m³ of water. The average production cost for southern pumping stations was Rs 0.55 / m³ compared to Rs 0.78 / m³ for northern pumping stations. 84% of all borehole-pumping stations have a production cost ranging between Rs 0.25 and Rs 1.25 per m³.

The energy wastage as quantified under phase 1 of the project amounts to Rs 3.6 million / year approximately, representing about 6% of the average annual electricity charges for borehole pumping stations of around Rs 60 million.

The following objectives have been set under Phase II of the project:-

- Review pump hydraulic characteristics and electrical ratings in relation to operational requirements
- Propose an energy management strategy to improve efficiency of pumping equipment
- Design an optimal and highly efficient pumping system
- Optimization of energy costs.

The projected amount of savings based on the calculation of the hydraulic capacity of pumps as highlighted in Phase 1 was expected to be around 10%. However, based on the findings under this report (Phase II), the energy savings that has been quantified is **Rs 6,566,266.86** which is equivalent to **5.71 %** of the annual electricity budget (2006-07)

CHAPTER 1

1.0 Introduction.

The Central Water Authority (CWA) is the sole supplier of potable water in Mauritius. It operates 129 pumping stations and six treatment plants across the island. The Authority has more than 300,000 registered domestic and industrial customers. The annual total volume of water produced, i.e. pumped and treated is around 300 Million m³ and the annual turnover based on water sales is **Rs 955 Million**. The annual electricity cost for the financial year 2005/06 is around **Rs 115 Million**.

Further to the study made by Research Assistants Messrs G.R Pudaruth & D. Gungabison for Phase 1 – Site Auditing under this project – “Energy Auditing, Management & Efficiency at CWA Pumping Stations”, it was recommended to carry out a pumping test of each borehole in order to re assess the hydraulic pump capacity and to reduce accordingly the annual energy wastage of **Rs 3.6 Million** due to oversized Submersible Pumps, inappropriate C.E.B Tariffs, Penalty Charges and Excess kVA demand.

Under Phase II of this project, I Mohammad A H Domah, Trainee Engineer (Mechatronics) have been given the responsibility of Research Assistant to carry out the overall and specific objectives of the project as set out by the Mauritius Research Council and Central Water Authority.

1.1 Overall Objectives:-

The overall objectives of this project under Phase II are as follows:

- Review pump hydraulic characteristics and electrical ratings in relation to operational requirements
- Propose an energy management strategy to improve efficiency of pumping equipment
- Design an optimal and highly efficient pumping system
- Optimize energy costs.

1.2 Specific Objectives:-

- Study the economics of pump replacement
- Determine the optimum yield of each borehole

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- Calculate the hydraulic duty point for pumps on each site with respect to borehole and distribution network characteristics.

1.3 Methodologies adopted:-

The methodologies adopted are detailed hereunder:

- Perform pumping tests and calculating the efficiency of the pump at its operational point for each borehole.
- Calculate the hydraulic characteristics of the distribution lines.
- Collect information regarding all operational boreholes characteristics with emphasis on safe pumping yield and actual pumping rates for both the normal and dry season.
- Review of electrical costs of the different pumps in use at CWA.
- Calculation of payback period for the equipment to be installed at each site.
- Researching on new techniques employed for pumping of potable water.

1.4 Methodology for Pumping Tests

1.4.1 The pump was made to operate at different flows by valve throttling the discharge valve and the following parameters were measured:

- Actual Flow (Q) - m³/hr
- Discharge Head of Pump at bend (H_d) in metres (m)
- Dynamic Water Level measured up to bend i.e. Static Head (H_s) of Pump in metres (m)
- Electrical Input Power to pump motor (P_m) in kilowatts (kW)

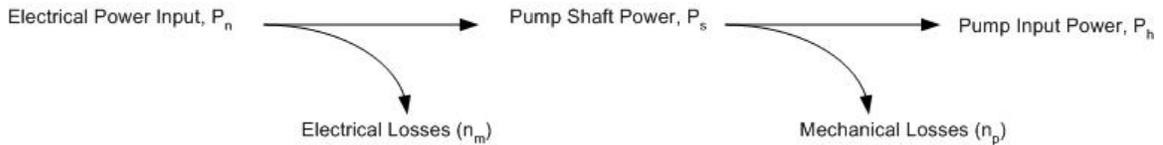
1.4.2 Instrumentation used for pumping test:-

- The actual flow rate was measured using the existing flow meter reading and a stopwatch.
- The pressure head at the bend was measured by a pressure gauge in Bar and the reading was then converted to meter (m) by the ratio 1 bar = 10 m
- The Dynamic Water Level (m) was measured using a sounding line.
- The electrical power input (kW) to the motor was measured using an energy meter.

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1.4.3 Based on the above mentioned measurements, the following calculations are done to determine the Pump Efficiency:

Energy conversion in operation of submersible pump



a) Hydraulic Output Power of the pump

$$\text{Hydraulic Power, } P_h \text{ (kW)} = \frac{Q \cdot (h_d - h_s) \cdot \rho \cdot g}{1000}$$

where Q = Volume flow rate in m³/s
 h_d = Discharge head (m)
 h_s = Suction Head (m)
 ρ = Density of Water (kg/m³)
 g = acceleration due to gravity – 9.8 m/s²

b) Pump Shaft Power, P_s

$$\text{Pump Shaft Power, } P_s = \frac{\text{Hydraulic Power, } P_h}{\text{Pump Efficiency, } \eta_{\text{pump}}} \text{ kW}$$

c) Electrical Input Power

$$\text{Electrical Input Power, } P_m = \frac{\text{Pump Shaft Power, } P_s}{\text{Electric Motor Efficiency, } \eta_m}$$

Also, the motor input P_m can be measured by using a portable power analyzer.

d) Pump Efficiency

The Pump Efficiency is calculated by the formula:

$$\eta_{\text{pump}} = \frac{\text{Hydraulic Power, } P_h}{\text{Pump Shaft Power, } P_s}$$

1.5 Calculation of hydraulic characteristic of distribution system:

The hydraulic characteristic of the distribution system has been done by using the 'L' profile of the distribution line obtained from the CWA's drawing office. The following information are gathered from the drawings as detailed below:

- No. of fittings installed (Bends, Sluice Valve, Air Valve, Reducer/Enlarger, Non-Return Valve) in the distribution line.
- Length and type of pipe in the distribution.
- Ground Level at Source, SGL
- Ground Level at destination, DGL

From the above information, the following calculations are done:

a) Static Head

The Static Head is the vertical distance between the liquid surfaces in the maximum height that the water will reach and it is given by the following formula:

$$\text{SHR} = \text{DGL} - \text{SGL} + \text{DWL}$$

Where:

SHR = Static Head Difference (m)

DGL = Ground level at destination (m)

SGL = Ground level at source (m)

DWL = Dynamic Water Level (m)

b) Pressure Head

The pressure head required at some point of the distribution line. If the end point is a reservoir or a balancing tank, then the pressure head would be 0 m.

c) Frictional Head Losses

There are two types of frictional head losses, viz

- Head loss due to friction in pipes
- Head loss due to friction in fittings

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d) Frictional Head loss in pipes

The frictional head loss in pipes is calculated by using the Haaland and the Darcy Weisbach formulae.

Haaland Formula:

$$\frac{1}{\sqrt{f}} = -3.6 \log \left(\frac{6.9}{R_e} + \left\{ \frac{K_s}{3.71D} \right\}^{1.11} \right)$$

where:

f = Friction factor of pipe

d = internal diameter of pipe

k_s = Roughness size on the internal surface of the pipes. The values of the roughness for different materials is given at *Annex-1*

R_e = Reynolds Number

Reynolds Number is determined by the following equation:

$$R_e = \frac{vd}{\gamma}$$

Where:

v = average velocity of the fluid in the pipe

d = pipe inside diameter

γ = kinematic viscosity of liquid (for water $\gamma = 1.14 \times 10^{-6} \text{ m}^2/\text{s}$)

The Haaland formula is used rather than the Colebrook equation, as the latter involves the friction factor on both sides and as per “*Mechanics of Fluids by B.S Massey*”, the friction factor calculated by Haaland will be less than 1.5% than that by Colebrook’s formula. This is considered to be acceptable.

Once the value for the friction factor is obtained, the Darcy - Weisbach equation is then used to calculate the friction head loss.

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Darcy - Weisbach Equation:

$$H_f = f \frac{L}{d} \frac{v^2}{2g}$$

Where:

H_f = Head loss due to friction in distribution pipe

f = Friction factor of pipe

L = Length of distribution pipe

d = internal diameter of distribution pipe

v = average velocity of fluid in pipe

g = acceleration due to gravity

e) Head loss due to friction in fittings

The head loss due to friction in fittings is calculated by using an equivalent length of straight pipe. These values are given hereunder:

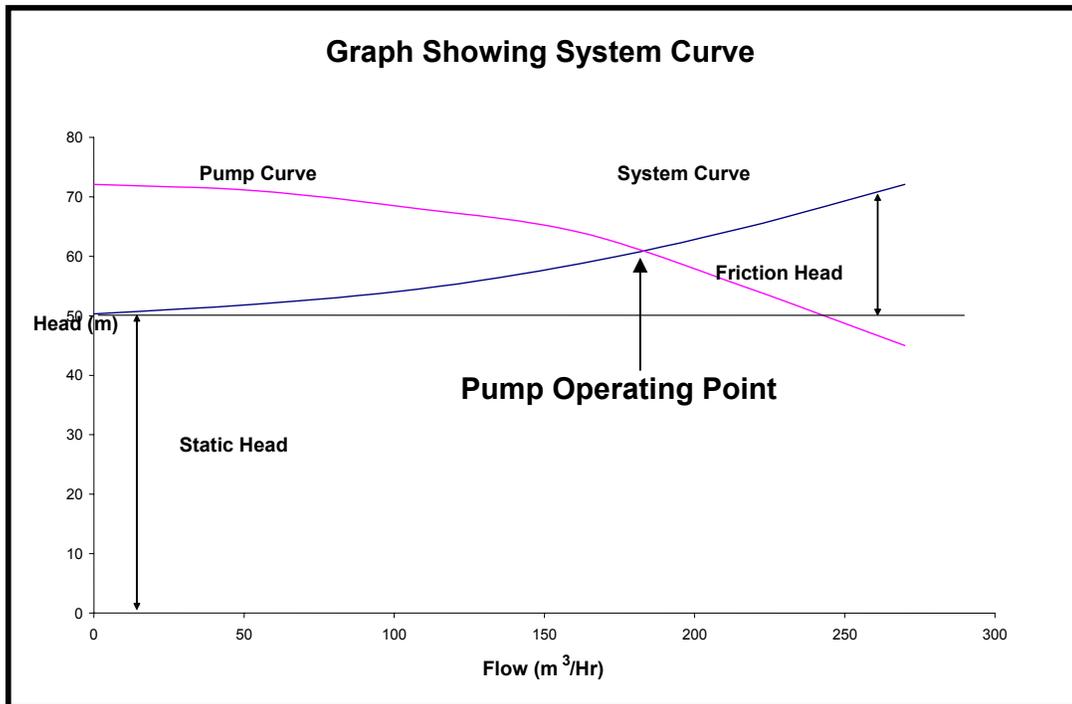
Type of Fitting	Equivalent Length of Straight Pipe (m)
Pump	150
Bend 90	18
Sluice Valve	7
Non return Valve	45
Air Valve	11
Tee	11
Reducer	45
Round Elbow	45

Using the above mentioned values, the equivalent lengths are then used in the calculation of the head loss in the fittings.

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1.6 System Curve

From the calculation of the different heads as described at section 1.5, the system curve is then drawn and by superimposing the pump curve on it, the operating point of the pump is obtained. At this point, the flow should be the safe yield of the borehole so that it is not depleted and the Dynamic Water Level of the borehole remains stable during operation of the pump.



The above mentioned graph shows the system curve for a pump pumping into a reservoir or a balancing tank.

1.7 Variation of system curve

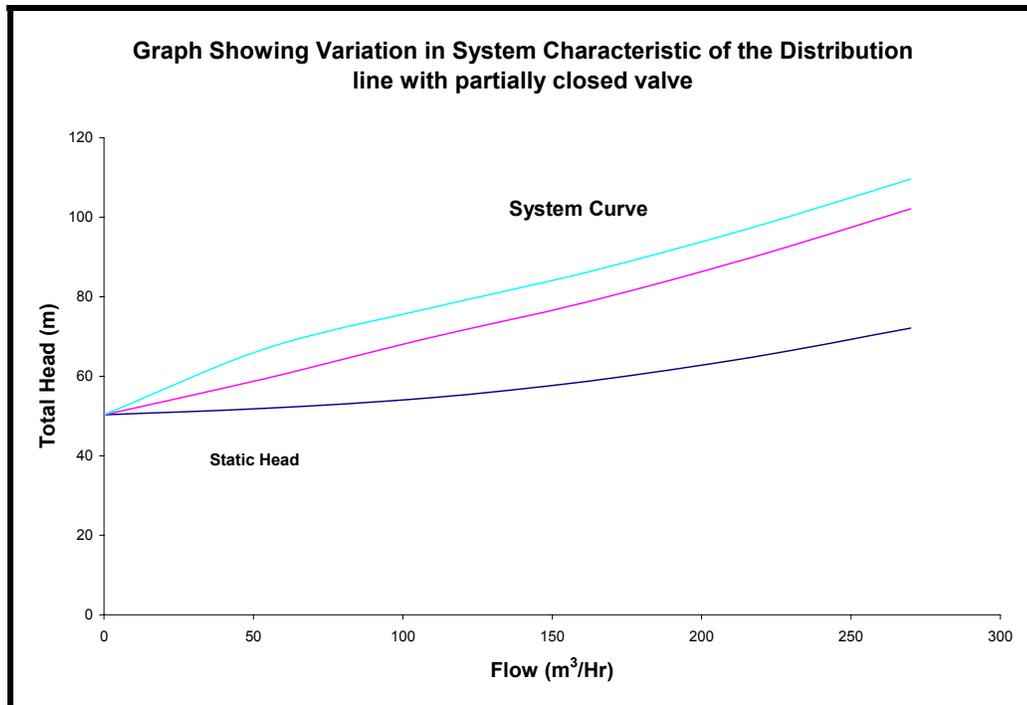
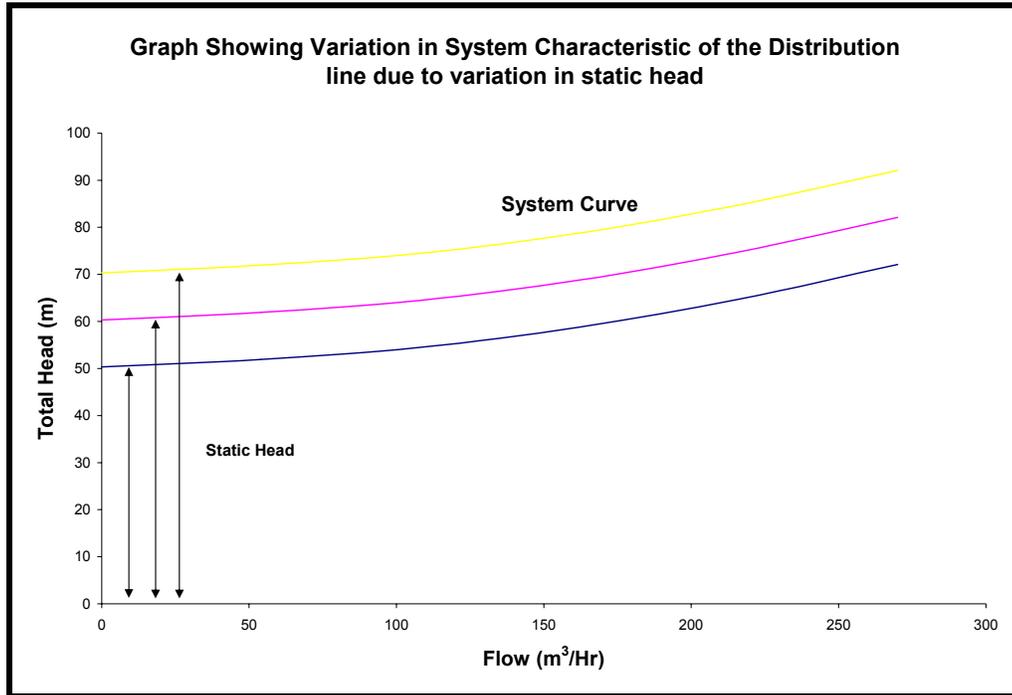
The system curve calculated is expected to remain the same at all periods, but however this is not the case. The system curve varies in two different ways:

- Variation due to changes in static head
- Variation due to new restriction being added up on the distribution line

Variation in static head occurs across the year due to changes in the Dynamic Water level of the borehole. In rainy seasons, the water level is high, but during dry seasons, there is a drastic drop in this water level. Whereas ‘variation due to new restriction being added up’ occurs when the demand on the distribution line decreases at night.

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The variation of the system curve is shown below:



1.8 Actual pumping Techniques.

The pumping of liquids consumes enormous quantities of energy, and deserves some thoughtful consideration by those who manage the profits/production costs when desiring to save more through energy management.

The electric motor of a submersible pump is a '2' Pole motor and the startup current when starting the motor is seven times the nominal/operation current of the motor. To avoid this over current at startup, there are several techniques used so that associated equipment in the operation of the pump are not oversized and also to avoid excess charges for the electrical power consumption. The most common operation techniques of submersible pumps in the authority are as follows:

- Direct On Line, DOL (up to 10kW)
- Star- Delta
- Auto - transformer Starter

In using an Auto transformer Starter, the starting current is limited to 2.5 times the nominal/operation current.

Other techniques for the startup and operation of submersible pumps include the use of **Soft-Starters or Variable Speed Drives, VSD.**

1.9 Sizing of Submersible Pumps

In determining the duty point of submersible pump the system curves of the distribution system is to be calculated. The system curve reflects the variation of the friction head and static head vary at different flow. The operation point of the submersible pump is the point of intersection between the System and the pump curves.

However, for situations where submersible pumps operate directly into the distribution mains, the system curve changes as new restriction add up in the static head component when consumption decreases at night. In such situations, the pump consumes more energy.

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1.10 Operation of Submersible pumps using Variable Speed drives.

As stated above, a centrifugal pump is a dynamic device with the pressure head generated from a rotary impeller. All the characteristics of the submersible pump are related to the velocity of the impeller of the pump. The equations relating the rotodynamic pump performance parameters of flow, head and power absorbed to speed are known as the *Affinity laws*:

$$Q \propto N$$

$$H \propto N^2$$

$$P \propto N^3$$

Where:

Q: Flow rate m³/Hr

H: Head (m)

P: Power Absorbed (kW)

N: Rotating Speed (rpm)

Based on these equations, it is expected that doubling the speed of the centrifugal pump will increase the power consumption by 8 times and conversely, a small reduction of the speed will result in drastic reduction of power consumption.

1.11 Test Results using Variable Speed Drive

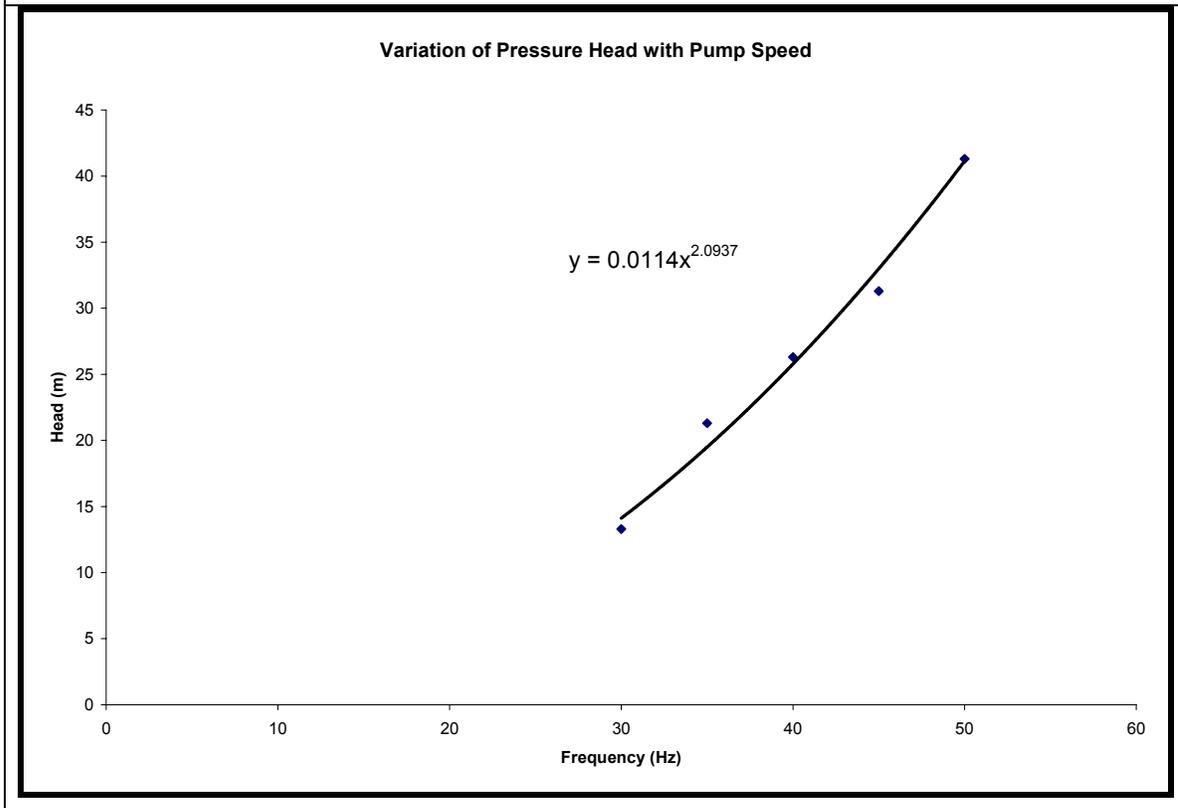
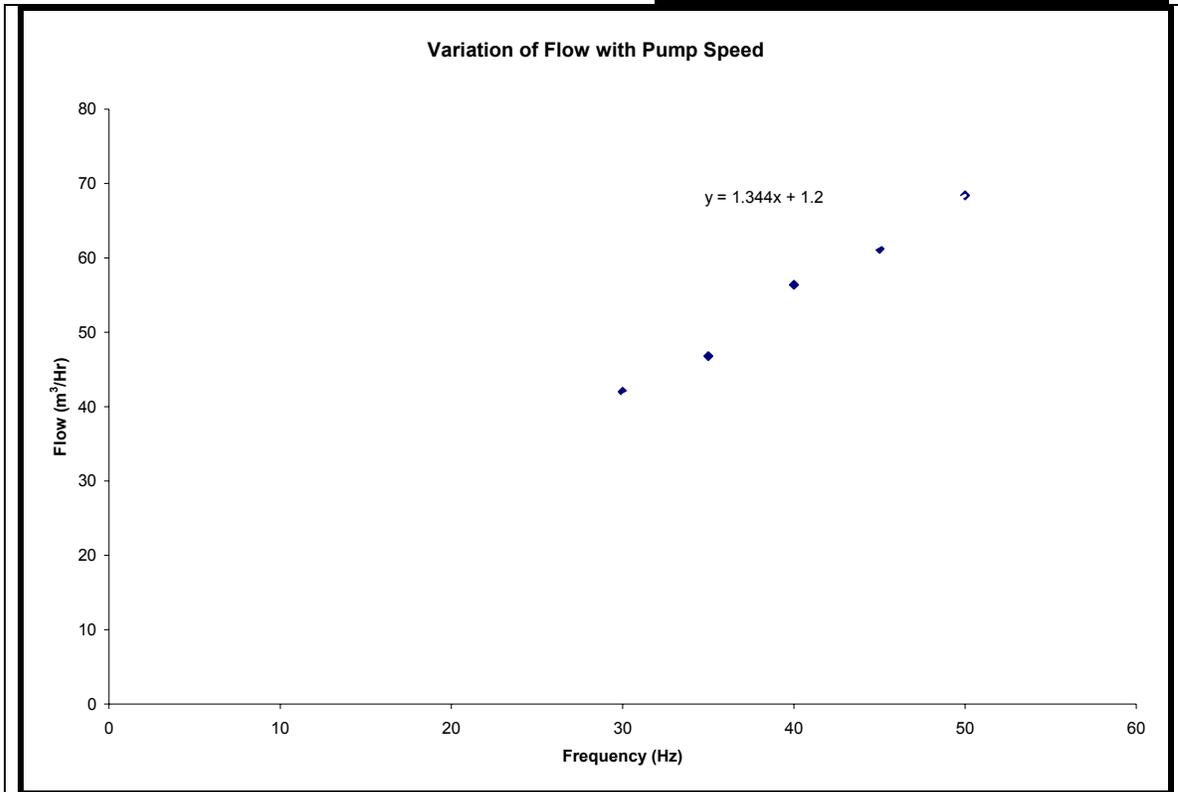
A 26kW Allen Bradley Variable Speed Drive was installed at Pailles Bench Test and was made to drive a Submersible Pump of make Saer rated at 125 m³/Hr x 32 m x 15kW ref: S 181-C2. The following results were obtained:

Test No	Drive Speed (Hz)	Flow (m ³ /hr)	Pressure (m)	Input to Variable Speed Drive					Input to Motor			
				Current (A)	Voltage (VAC)	pf	kW	kVA	Current (A)	Voltage (VAC)	pf	kW
1	50	68.4	41.3	33.7	408.0	0.995	18.3	18.6	27.2	391.6	0.813	11.0
2	45	61.2	31.3	19.8	408.0	0.995	13.8	13.9	26.2	322.6	0.820	12.6
3	40	56.4	26.3	14.8	409.0	0.993	10.4	10.5	22.9	256.8	0.980	8.8
4	35	46.8	21.3	11.8	410.0	0.988	8.6	8.4	20.4	195.2	0.850	6.1
5	30	42	13.3	8.2	410.0	0.990	5.7	5.8	19.6	192.8	0.860	4.0

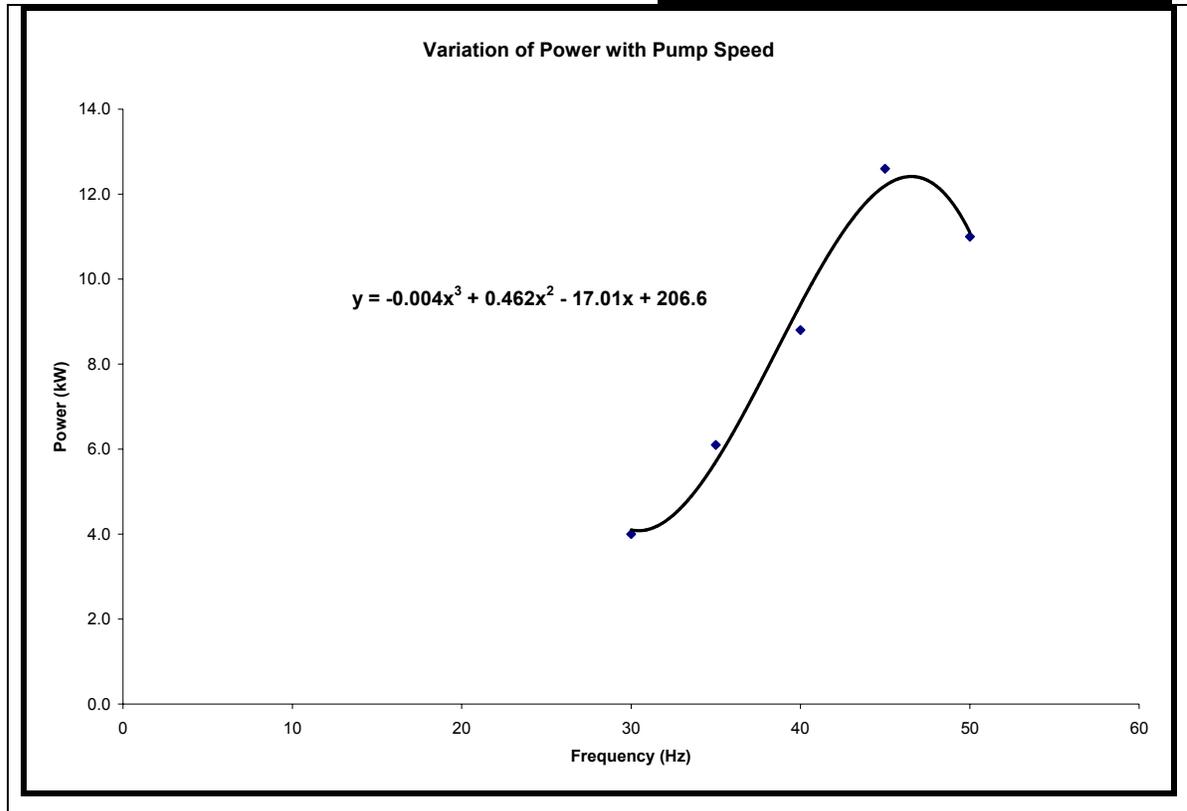
Based on the above mentioned results it is shown that as per laws of Affinity,

- The flow rate varies directly with the pump Speed.
- The pump head varies directly to the square of the pump speed (N²)
- The pump power varies to the cube of the pump speed (N³)

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CHAPTER 2

Analysis

2.1 Introduction.

This chapter deals with the analysis based on pump performance tests, theoretical pump curve, characteristic of distribution system and borehole information gathered from the Water Resources Unit and electricity cost from the Central Electricity Board.

2.2 Electrical Cost Analysis.

From the information gathered from Water Resources Unit, Central Water Authority – NRW (Non Revenue Water Section) and the Central Electricity Board, the electrical cost of production per meter cube of water has been done and same is given at **Annex – 2, 3, 4, 5, 6.**

The cost of production for the year 2004 was **Rs 0.74 /m³** and the cost of production for the year 2005 was **Rs 0.77 /m³**

The cost of production for Northern Pumping stations was **Rs 0.71 /m³** (2004) and **Rs 0.70 /m³** (2005) and the cost of production for Southern Pumping stations was **Rs 0.68 /m³** (2004) and **Rs 0.75 /m³** (2005)

It is observed that pumping stations operating directly on the distribution line have a cost of production near Rs 1.0 /m³

It is also observed that the penalty charges on Excess kVA demand amounts to **Rs 111,900** in 2004 (0.182% of Annual Electricity Cost) and **Rs 84,530** in 2005 (0.119% of Annual Electricity Cost). These cases of Excess kVA have occurred prior to the installation of Power Factor Correctors and due to failure of the installed Power Factor Correctors on sites

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2.3 Analysis based on System Characteristic

The following sites have been omitted due to the following reasons:

Site	Reason
Constance BH 459, Petit Paquet BH 900 and Belle Rose Clemencia Pumping Station BH 42	These Sites are being upgraded under the contract MW 32, and the system characteristics are under change
Bassin Loulou (Jamblon) BH	Pump Test not possible due to blocked piezzo pipe.
New Cottage BH 564	Installed Electronic Flowmeter is out of service and installation of NRW's Ultrasonic Flowmeter not possible

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2.31 Analysis for DWS – Port Louis system

Beau Bois BH825 (CEB Acc: 3C7476)

The Borehole characteristics are:

Borehole Depth: 123 m

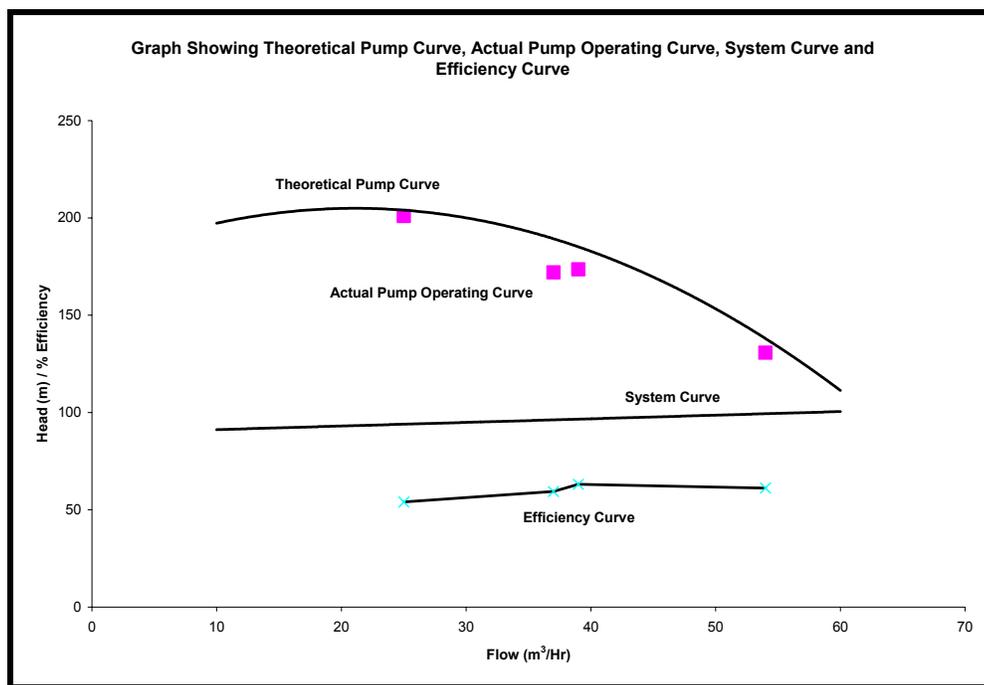
Dynamic Water Level: 20.71m

Safe Yield: 40 m³/hr

Installed Pump Hydraulic Capacity: - 50 m³/hr x 150 m x 30 kW

Pump Make: Caprari

Date Installed: 13-11-03



Based on pump performance tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical curve. The intersection point between the system curve and theoretical pump curve is found to be above the safe yield. The efficiency of the pump at its operational point is 63.1%. This pump is found to be overrated as the borehole suffers recurrent drop in its dynamic water level. Based on a pump efficiency of 70% and the available motor the required hydraulic capacity of pump would be 40 m³/hr x 100m x 17.5 kW

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Beau Bois BH871 (CEB Acc:3C7872)

The Borehole characteristics are:

Borehole Depth: 120 m

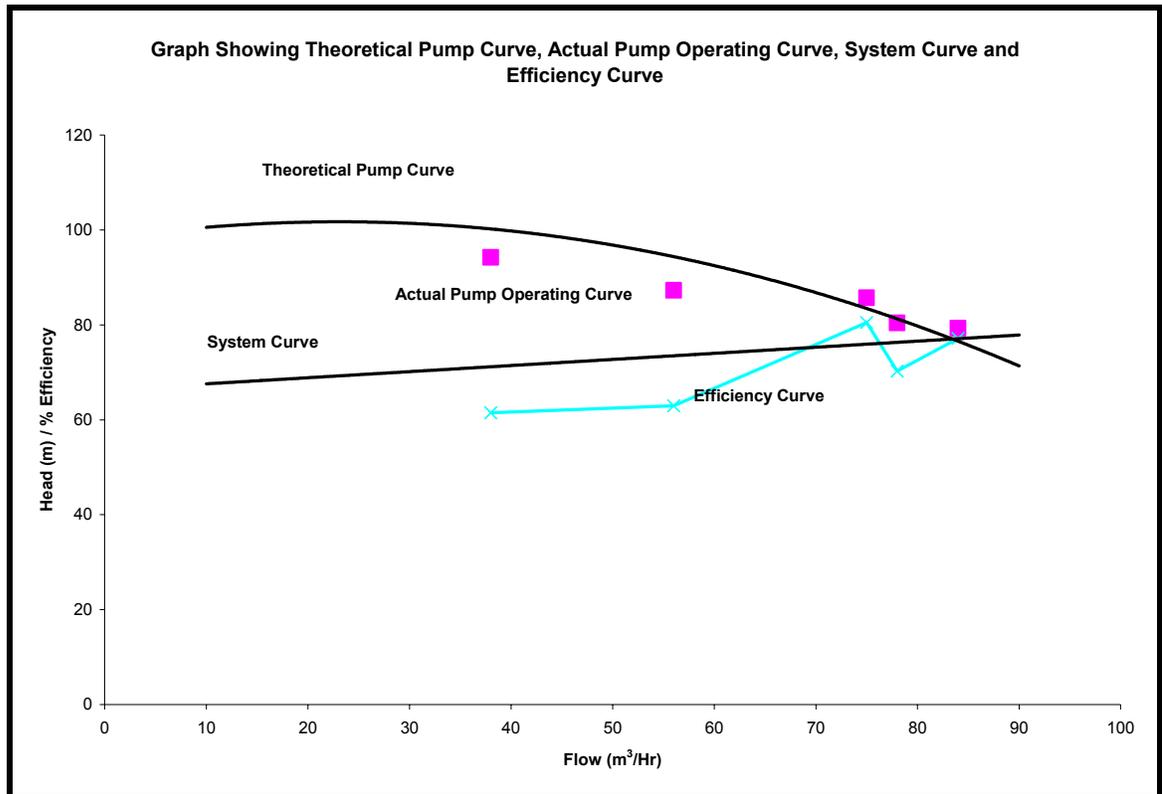
Dynamic Water Level: 33.25m

Safe Yield: 88 m³/hr

Installed Pump Hydraulic Capacity: - 75 m³/Hr x 80 m x 26 kW

Pump Make: Caprari

Date Installed: 16-05-03



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 70.24%.

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Beau Bois BH76B

The Borehole characteristics are:

Borehole Depth: 59.4 m

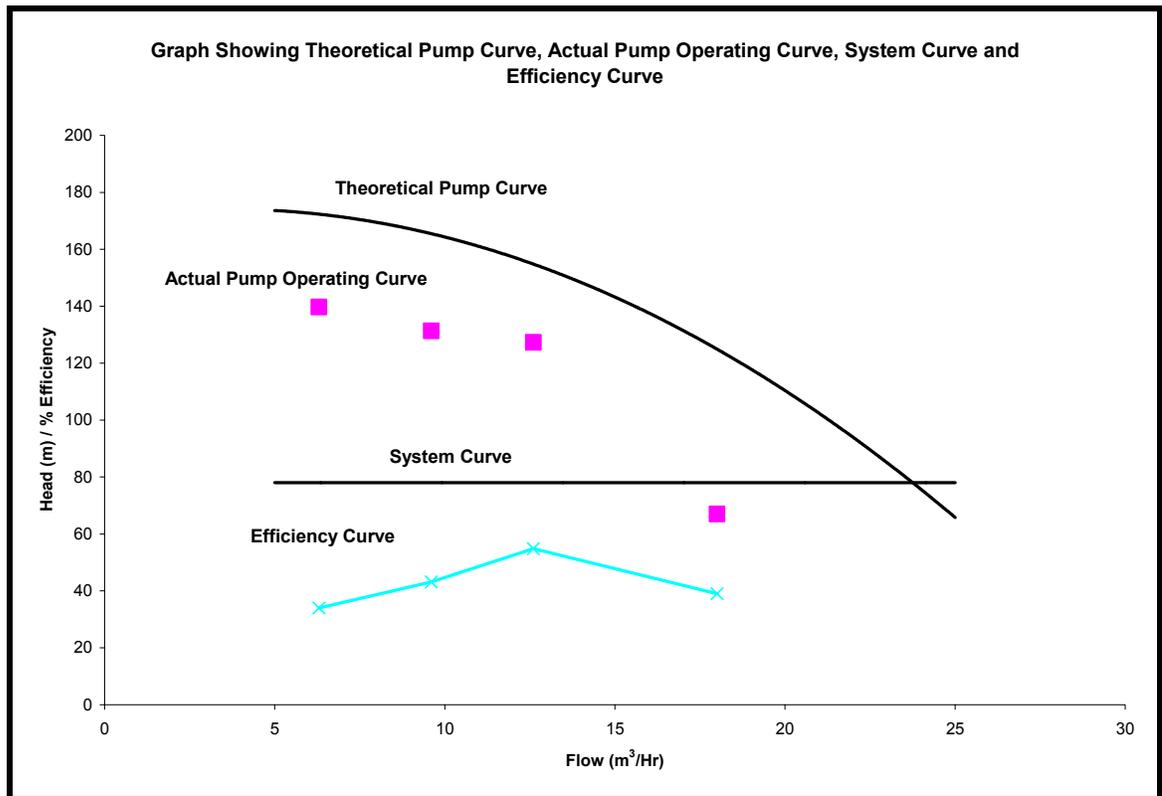
Dynamic Water Level: 20.4 m

Safe Yield: 15 m³/hr

Installed Pump Hydraulic Capacity: - 20 m³/Hr x 91 m x 11 kW

Pump Make: Caprari

Date Installed: 22-07-05



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. However, the intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 39.1%. This pump is overrated and the borehole suffers recurrent drop in water level under operation of this pump. The required pump based on an efficiency of 70% and available motor would be 15 m³/hr x 80m x 7.5kW

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Beau Songes BH722C (CEB Acc:7C7212)

The Borehole characteristics are:

Borehole Depth: 85 m

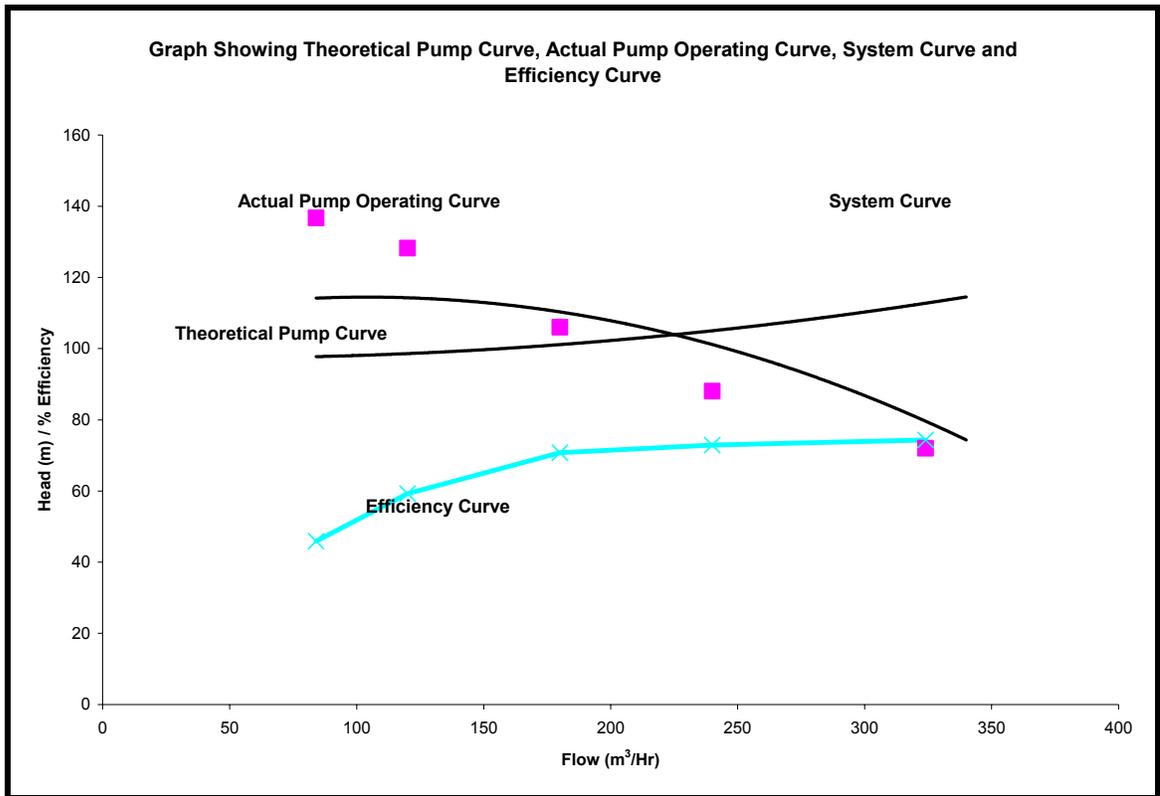
Dynamic Water Level: 51.4 m

Safe Yield: 240 m³/hr

Installed Pump Hydraulic Capacity: - 240 m³/Hr x 100 m x 92 kW

Pump Make: Caprari

Date Installed: : 28-07-99



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. However, the intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 74.3%.

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Beau Songes BH 722B (CEB Acc:7C7212)

The Borehole characteristics are:

Borehole Depth: 81 m

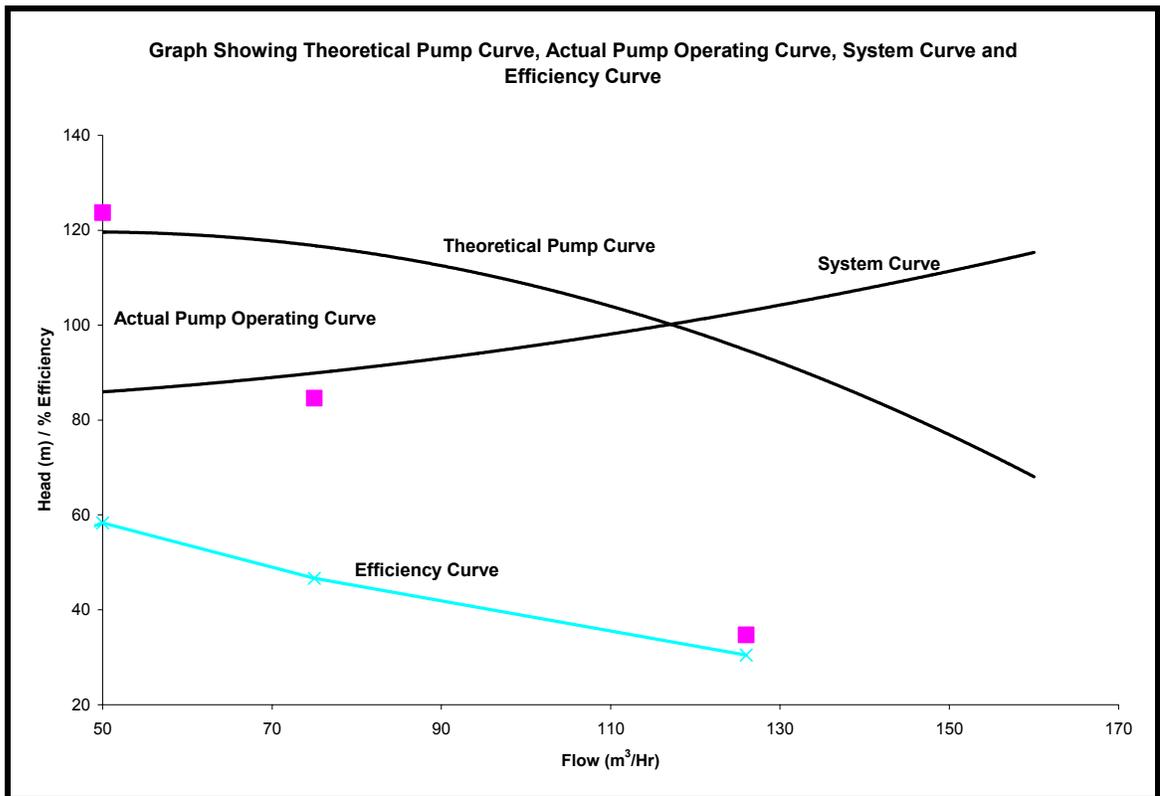
Dynamic Water Level: 50.35 m

Safe Yield: 110 m³/hr

Installed Pump Hydraulic Capacity: - 100 m³/Hr x 125 m x 45 kW

Pump Make: Caprari

Date Installed: 06-01-02



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 30.5%. The required pump based on an efficiency of 70% and available motor would be 110 m³/hr x 100m x 45kW

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Petite Riviere BH F2A (CEB Acc:1C4072)

The Borehole characteristics are:

Borehole Depth: 42 m

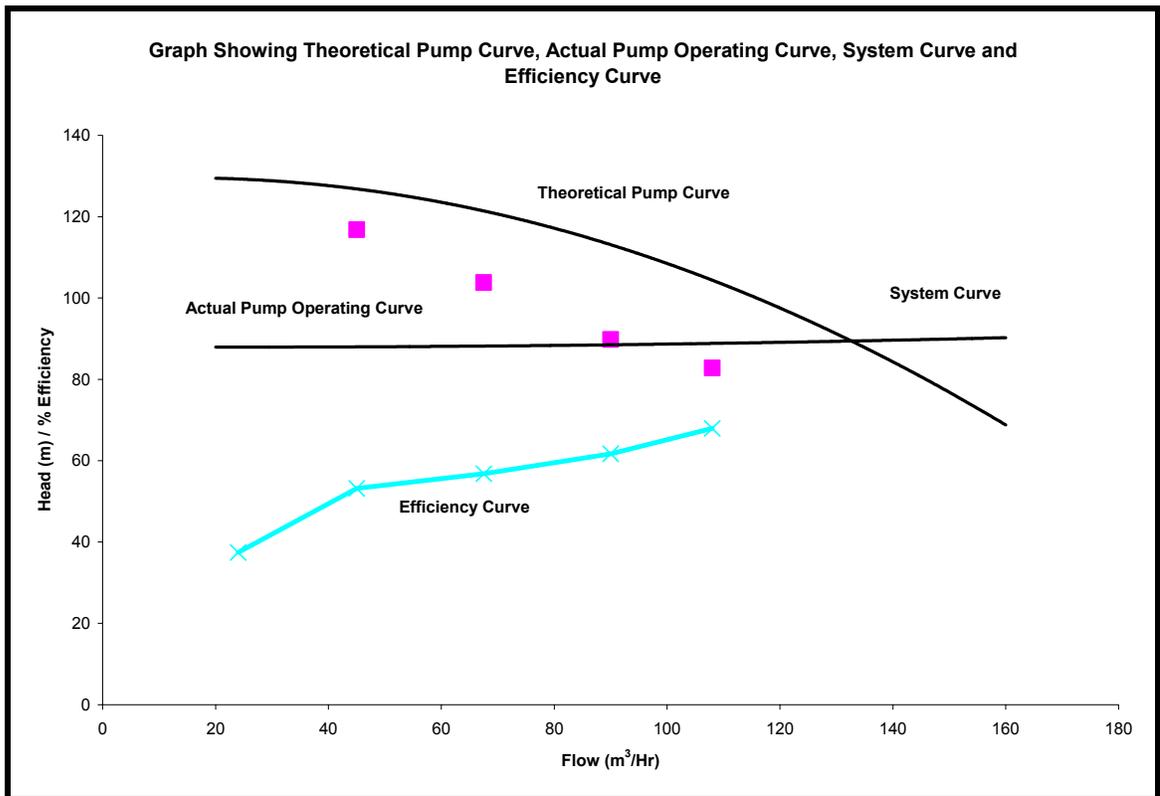
Dynamic Water Level: 37.7 m

Safe Yield: 114 m³/hr

Installed Pump Hydraulic Capacity: - 90 m³/Hr x 100 m x 37 kW

Pump Make: Caprari

Date Installed: 13-06-00



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. However, the intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 67.93%.

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Pierrefonds BH712 (CEB Acc:7C7172)

The Borehole characteristics are:

Borehole Depth: 145 m

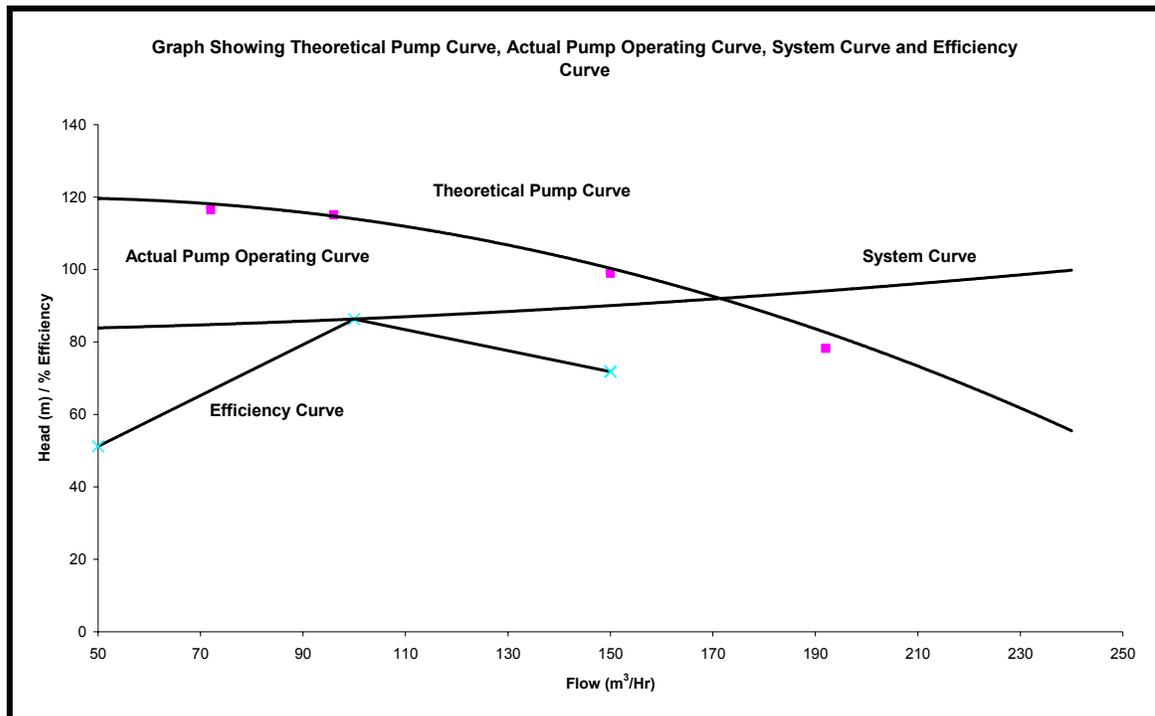
Dynamic Water Level: 67.31 m

Safe Yield: 170 m³/hr

Installed Pump Hydraulic Capacity: - 200 m³/Hr x 75 m x 59 kW

Pump Make: Caprari

Date Installed: 05-12-04



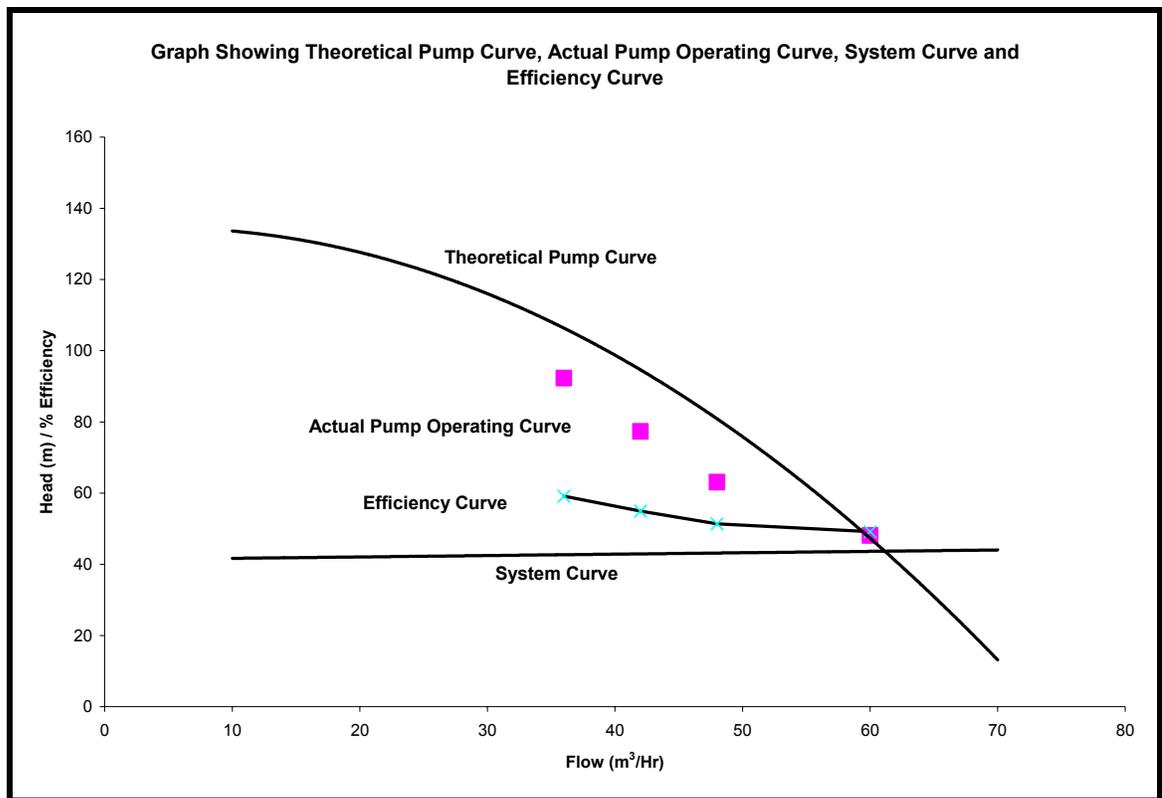
Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 71.8%.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

St Martin BH 367 A& B (CEB Acc:3C5942)

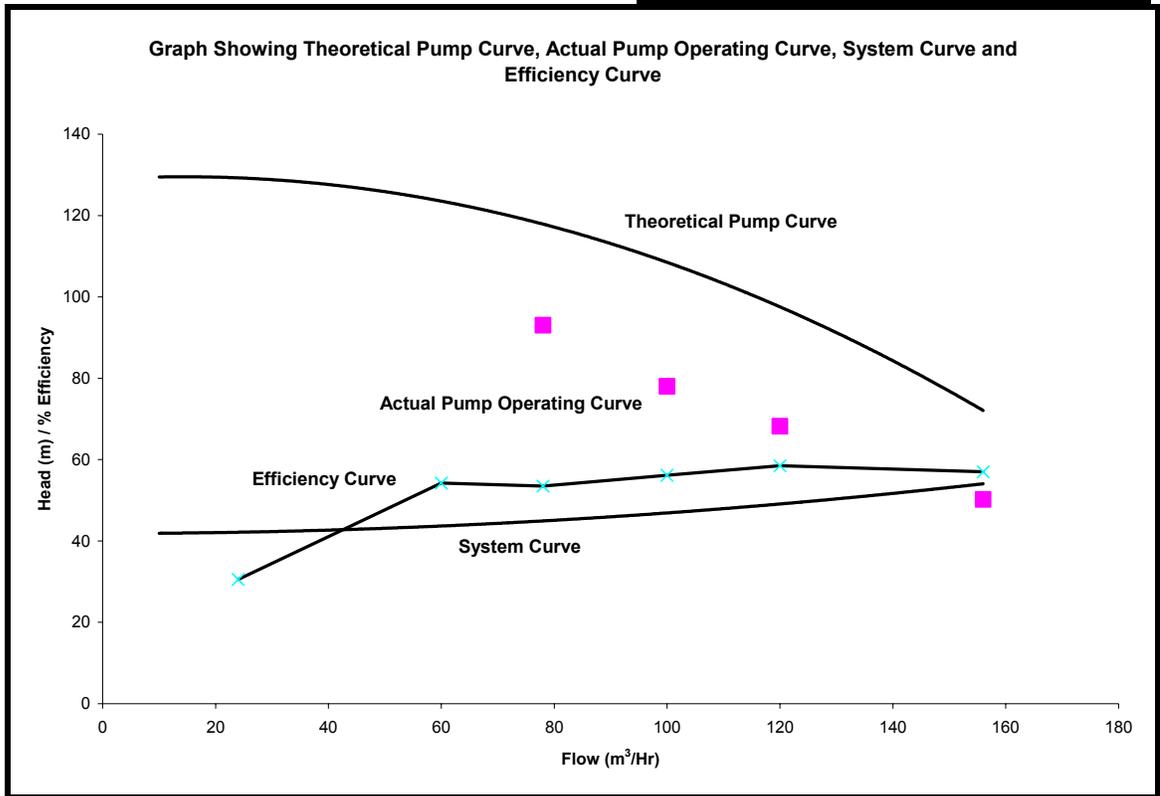
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 367A	BH367B
Borehole Depth:	33 m	34 m
Dynamic Water Level:	22.8 m	20.8 m
Safe Yield:	75 m ³ /Hr	123 m ³ /Hr
Installed Pump Hydraulic Capacity:	50 m ³ /Hr x 75 m x 15 kW	120 m ³ /Hr x 90 m x 45 kW
Pump Make:	Super D	Caprari
Date Installed:	22-07-98	11-09-03



St Martin 367A

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II



St Martin 367B

Based on tests,

- For St Martin 367A it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve and there is no intersection between the system curve and theoretical pump. The efficiency of the pump at its operational point is 56.97%. The required pump based on an efficiency of 70% and available motor would be 75 m³/hr x 50 m x 15 kW
- For St Martin 367B it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. However, the intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 49.8%. The required pump based on an efficiency of 70% and available motor would be 120 m³/hr x 50 m x 22 kW

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

2.32 Analysis for DWS – North system

Belle Vue Mauricia BH82 (CEB Acc: 6C1527)

The Borehole characteristics are:

Borehole Depth: 64.3 m

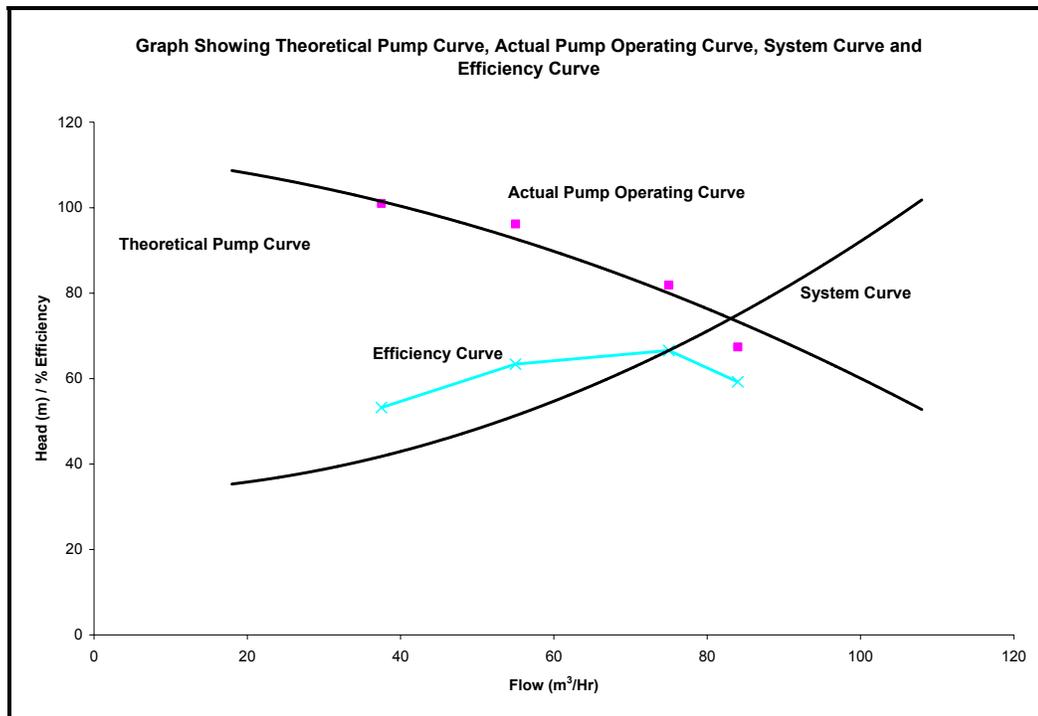
Dynamic Water Level: 36.54 m

Safe Yield: 78 m³/Hr

Installed Pump Hydraulic Capacity: 75 m³/Hr x 80 m x 26 kW

Pump Make: Caprari

Date Installed: 18-08-03



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 66.6% and is acceptable.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Bassin Loulou Gallery

The Borehole characteristics are:

Well Depth: 5 m

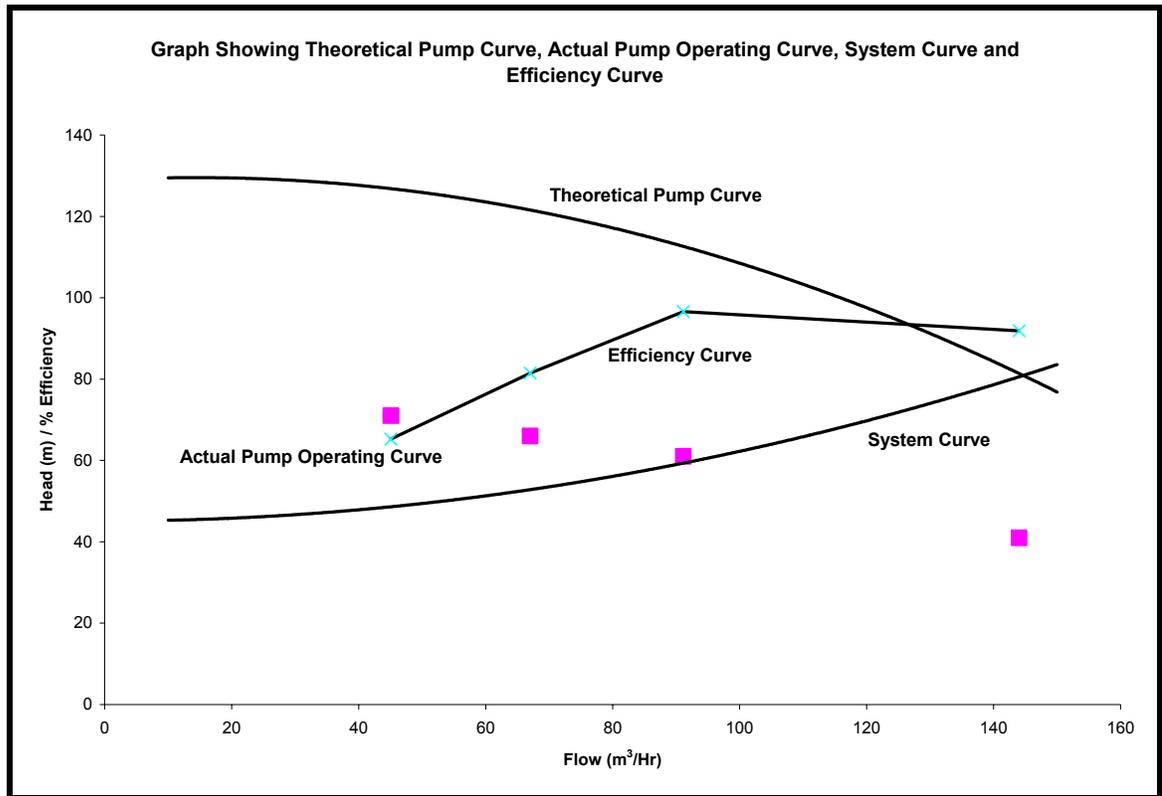
Dynamic Water Level: 3m

Safe Yield: 90 m³/Hr

Installed Pump Hydraulic Capacity: 90 m³/Hr x 60 m x 22 kW

Pump Make: Caprari

Date Installed: 17-06-00



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 91.96% and is acceptable.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Beau Plateau BH 737 (CEB Acc:2C7103)

The Borehole characteristics are:

Borehole Depth: 125 m

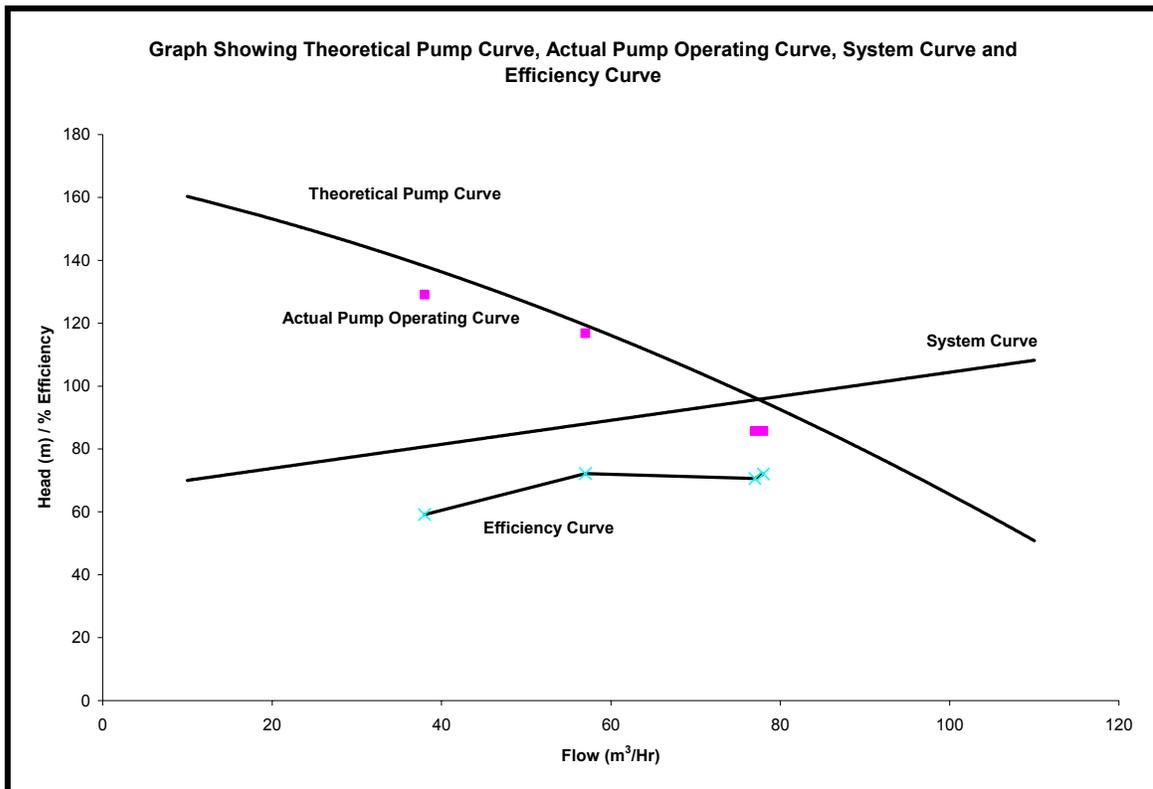
Dynamic Water Level: 23 m

Safe Yield: 100 m³/Hr

Installed Pump Hydraulic Capacity: 77 m³/Hr x 92 m x 26 kW

Pump Make: Grundfos

Date Installed: 18-03-03



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 72.1%. This site is underutilized.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Bois Mangués BH 12 (CEB Acc: 6C1528)

The Borehole characteristics are:

Borehole Depth: 66 m

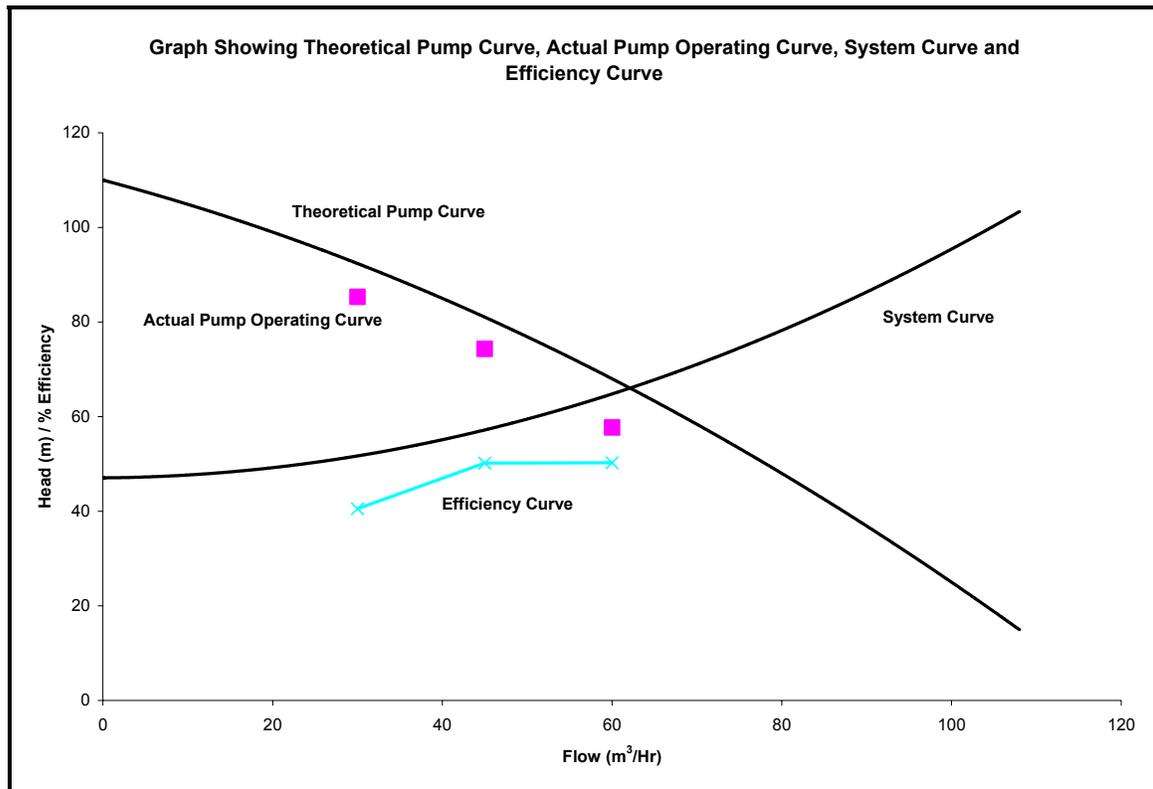
Dynamic Water Level: 46 m

Safe Yield: 54 m³/Hr

Installed Pump Hydraulic Capacity: 60 m³/Hr x 70 m x 22 kW

Pump Make: Used Super D

Date Installed: 28-11-03



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 50.2%. This is due to the use of an oversized motor. The recommended pump based on a pump efficiency of 70% and available motor rating; will be 50 m³/hr x 60 m x 11kW

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Camp La Boue BH SW26 (CEB Acc:6C6109)

The Borehole characteristics are:

Borehole Depth: 25 m

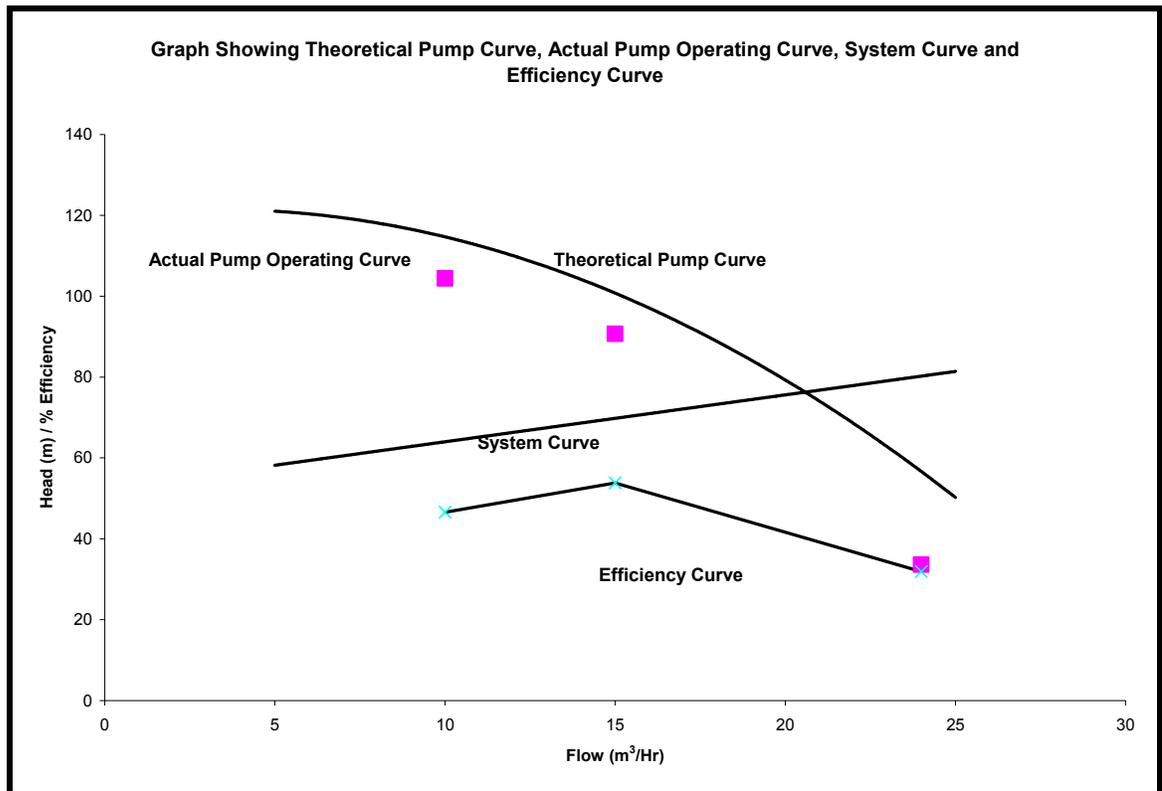
Dynamic Water Level: 9 m

Safe Yield: 24 m³/Hr

Installed Pump Hydraulic Capacity: 20 m³/Hr x 75 m x 5.6 kW

Pump Make: Used Super D

Date Installed: 01-03-99



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 31.9%. The recommended pump based on a pump efficiency of 70% and available motor rating; will be 25m³/hr x 80m x 11 kW

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Camp Thorel BH 754 (CEB Acc: 6C7201)

The Borehole characteristics are:

Borehole Depth: 91 m

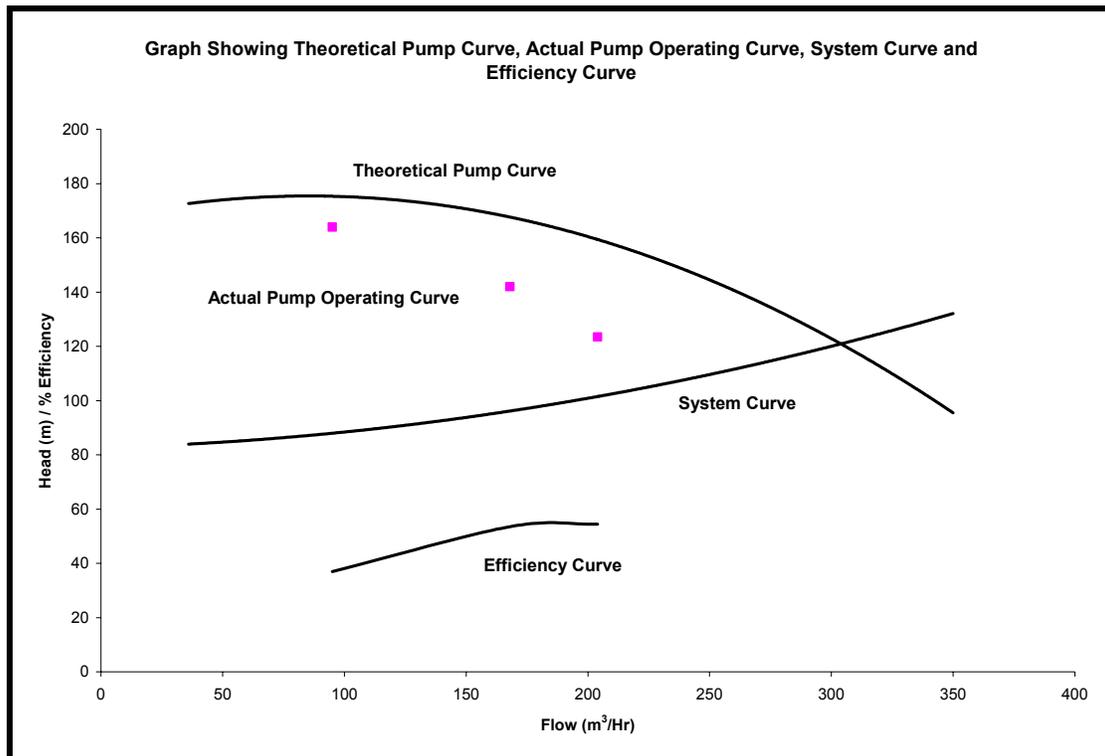
Dynamic Water Level: 23.37 m

Safe Yield: 240 m³/Hr

Installed Pump Hydraulic Capacity: 330 m³/Hr x 105 m x 132 kW

Pump Make: Caprari

Date Installed: 25-10-04



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above the safe yield. The efficiency of the pump at its operational point is 54.4% and is acceptable. This pump is highly overrated. The recommended pump at the safe yield based on a pump efficiency of 70% and available motor rating would be 240 m³/Hr x 110 m x 110 kW.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Cottage Poonith BH 563A (CEB Acc: 2C4693)

The Borehole characteristics are:

Borehole Depth: 80 m

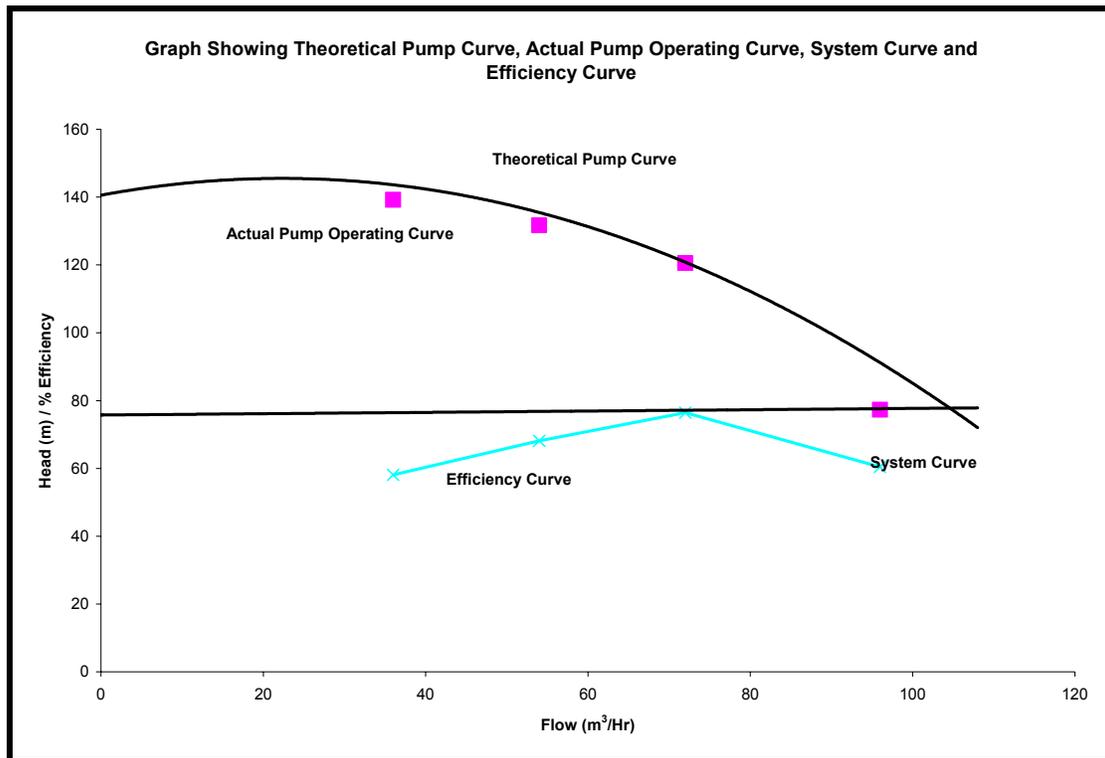
Dynamic Water Level: 46.4 m

Safe Yield: 108 m³/Hr

Installed Pump Hydraulic Capacity: 72 m³/Hr x 120 m x 37 kW

Pump Make: Caprari

Date Installed: 11-03-05



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 76.5%.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Esperance Trebuchet BH 537A (CEB Acc: 2C3014)

The Borehole characteristics are:

Borehole Depth: 46.02 m

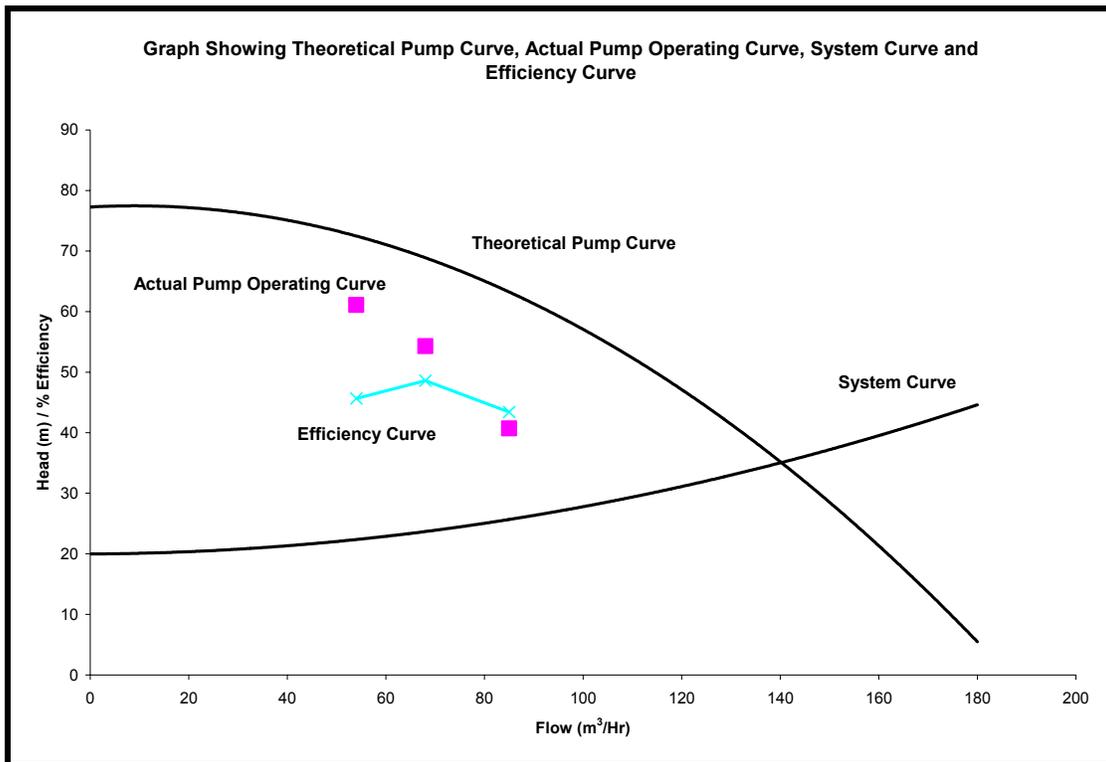
Dynamic Water Level: 20.35 m

Safe Yield: 108 m³/Hr

Installed Pump Hydraulic Capacity: 90 m³/Hr x 55 m x 18.5 kW

Pump Make: Jetspa

Date Installed: 16-09-04



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above safe yield. The efficiency of the pump at its operational point is 43.43%. However, the delivery head of the pump is overrated. The recommended pump at the safe yield, based on a pump efficiency of 70% and available motor rating would be 110 m³/Hr x 35 m x 15 kW.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Fond Du Sac BH 1 (CEB Acc: 6C2562)

The Borehole characteristics are:

Borehole Depth: 48.76 m

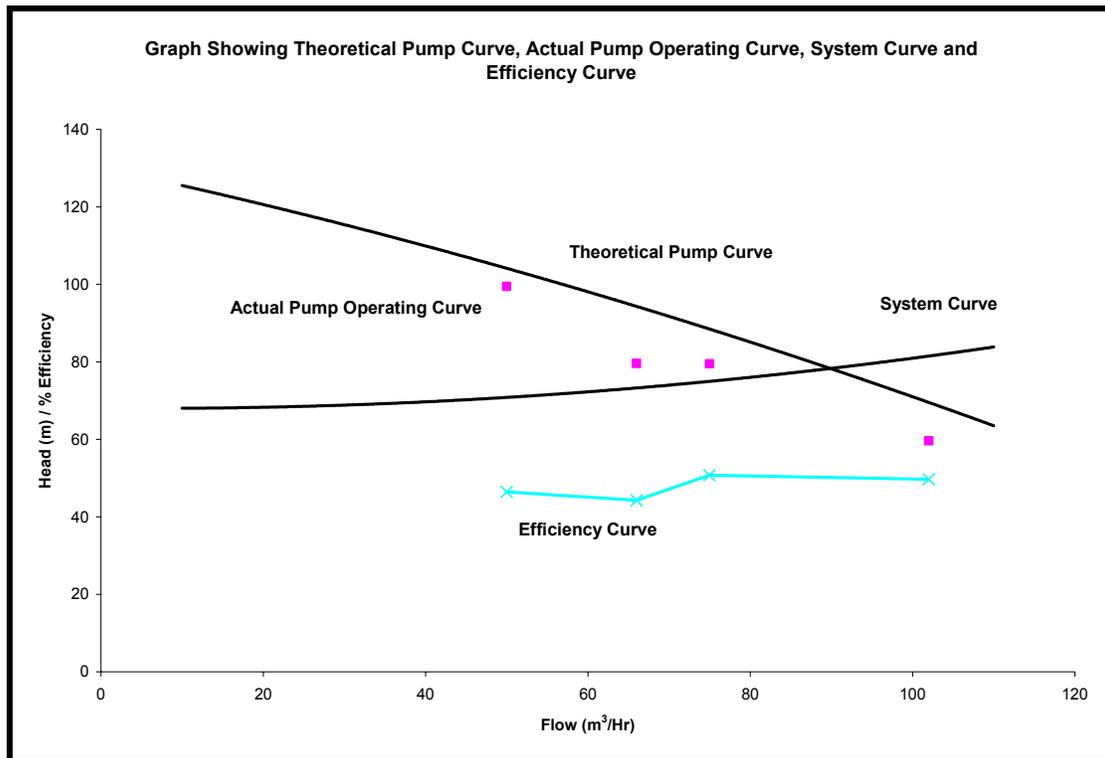
Dynamic Water Level: 39.44 m

Safe Yield: 72 m³/Hr

Installed Pump Hydraulic Capacity: 100 m³/Hr x 95 m x 30 kW

Pump Make: Rovatti

Date Installed: 25-09-01



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above safe yield. The efficiency of the pump at its operational point is 50.8%. The delivery head of the pump is overrated. The recommended pump at the safe yield, based on a pump efficiency of 70% and available motor rating would be 72 m³/Hr x 80 m x 22 kW

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Fond Du Sac BH 643 (CEB Acc: 6C2562)

The Borehole characteristics are:

Borehole Depth: 47 m

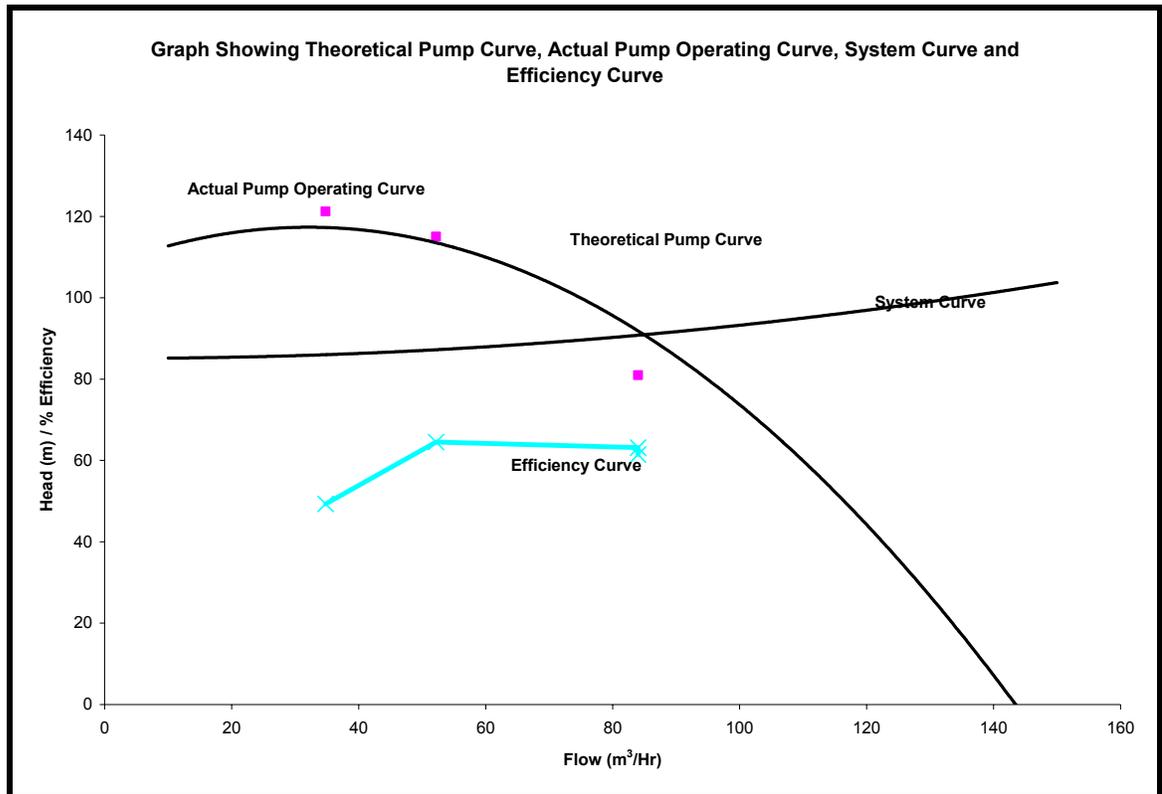
Dynamic Water Level: 39.85 m

Safe Yield: 152 m³/Hr

Installed Pump Hydraulic Capacity: 90 m³/Hr x 100 m x 37 kW

Pump Make: Rovatti

Date Installed: 09-10-02



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 61.5%.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Fond Du Sac - Forbach BH 743 (CEB Acc: 6C7464)

The Borehole characteristics are:

Borehole Depth: 123 m

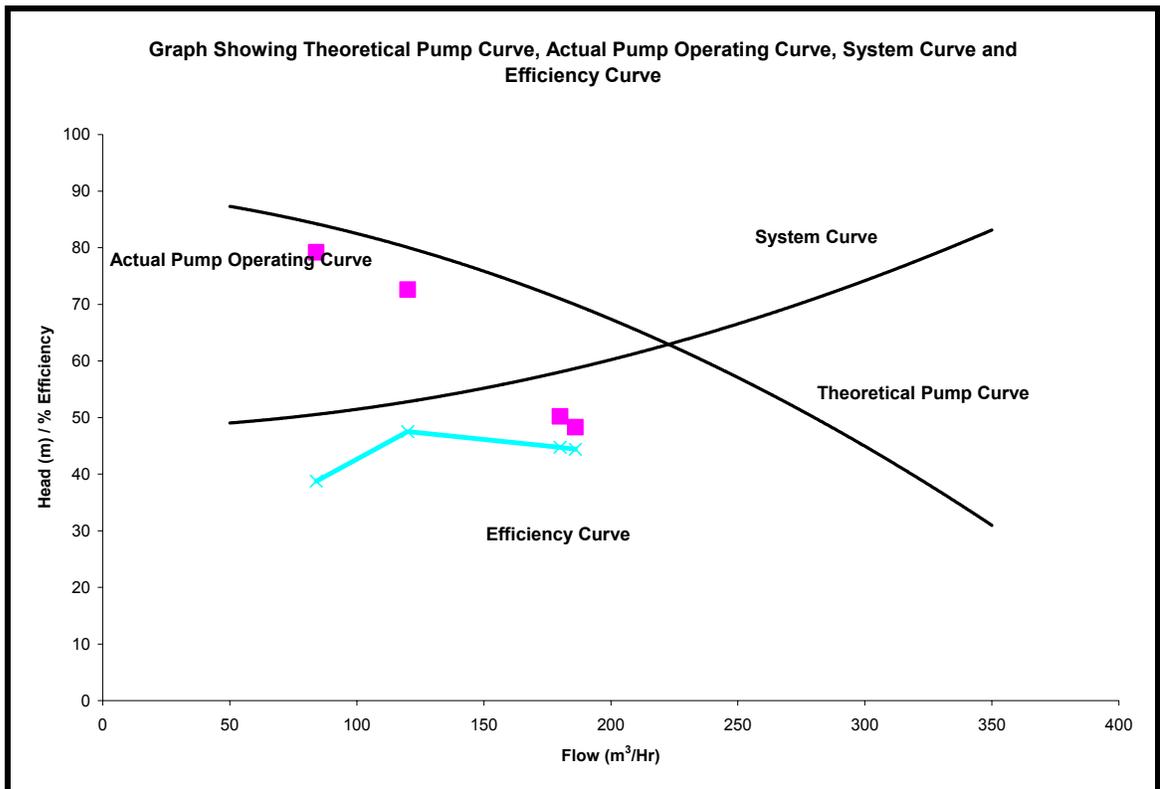
Dynamic Water Level: 47 m

Safe Yield: 261 m³/Hr

Installed Pump Hydraulic Capacity: 240 m³/Hr x 60 m x 55 kW

Pump Make: Rovatti

Date Installed: 01-07-04



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 44.4%. The recommended pump at the safe yield, based on a pump efficiency of 70% and available motor rating would be 260 m³/Hr x 70 m x 70 kW

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Haute Rive BH 391B (CEB Acc:2C2854)

The Borehole characteristics are:

Borehole Depth: 40 m

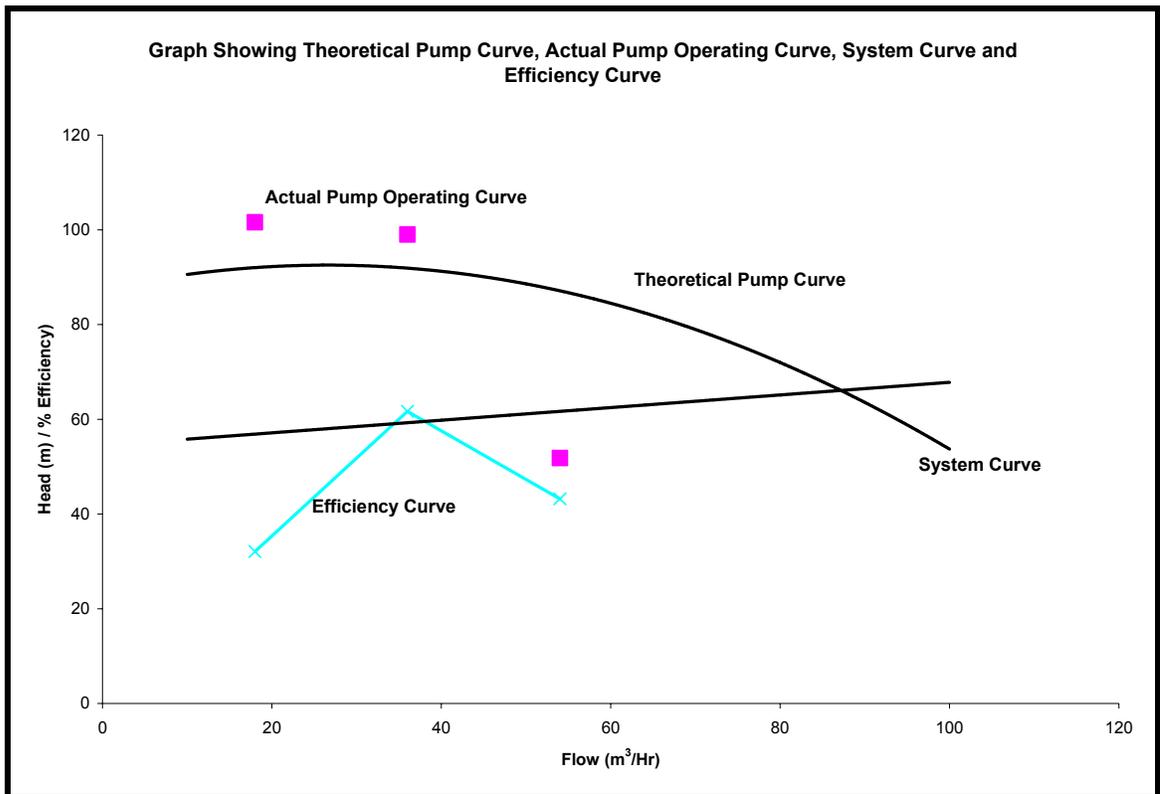
Dynamic Water Level: 22 m

Safe Yield: 72m³/Hr

Installed Pump Hydraulic Capacity: 80 m³/Hr x 70 m x 22 kW

Pump Make: Caprari

Date Installed: 19-10-01



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. However, this yield is rarely achieved. The efficiency of the pump at its operational point is 43.2%. Based on a pump efficiency of 70% and available motor rating a pump of rating 60 m³/Hr x 70 m x 18.5 kW is recommended

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

La clemence BH 692 (CEB Acc:2C6258)

The Borehole characteristics are:

Borehole Depth: 60 m

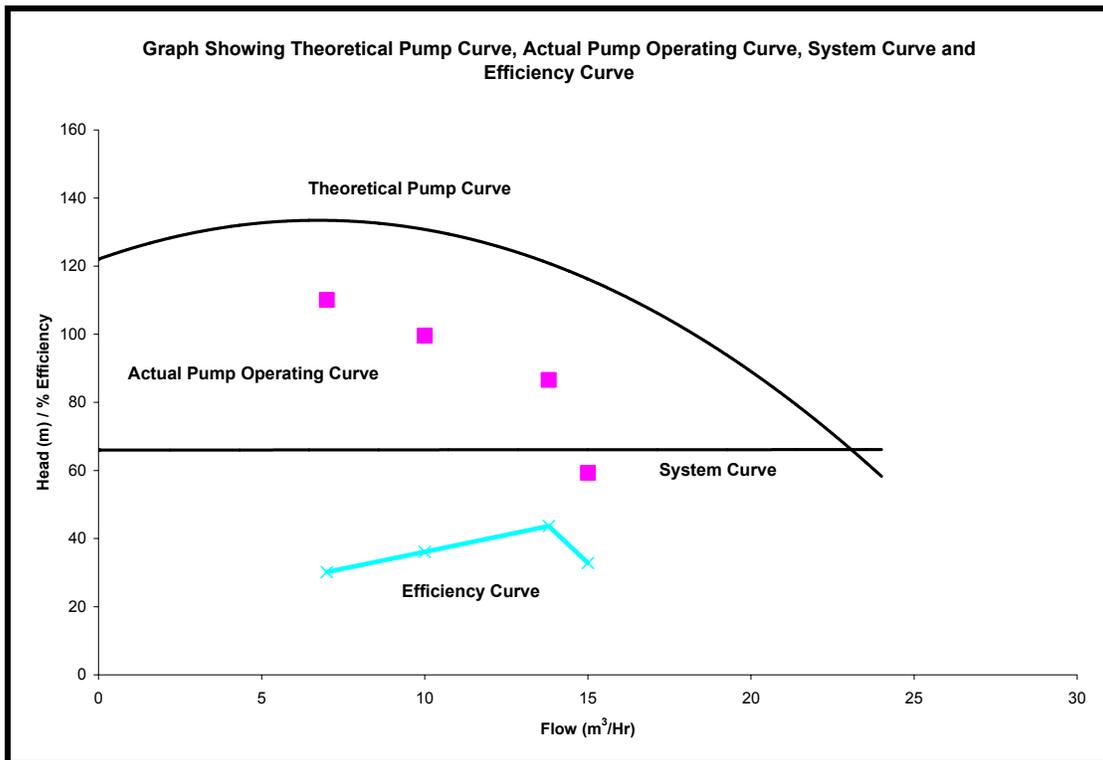
Dynamic Water Level: 29.47 m

Safe Yield: 54 m³/Hr

Installed Pump Hydraulic Capacity: 20m³/Hr x 90m x 11kW

Pump Make: Caprari

Date Installed: 18-01-04



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above the safe yield. The efficiency of the pump at its operational point is 32.8%. Based on a pump efficiency of 70% and available motor rating a pump of rating 20 m³/Hr x 70 m x 7.5 kW is recommended

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

La Louisa BH 936 (CEB Acc:)

The Borehole characteristics are:

Borehole Depth: 101 m

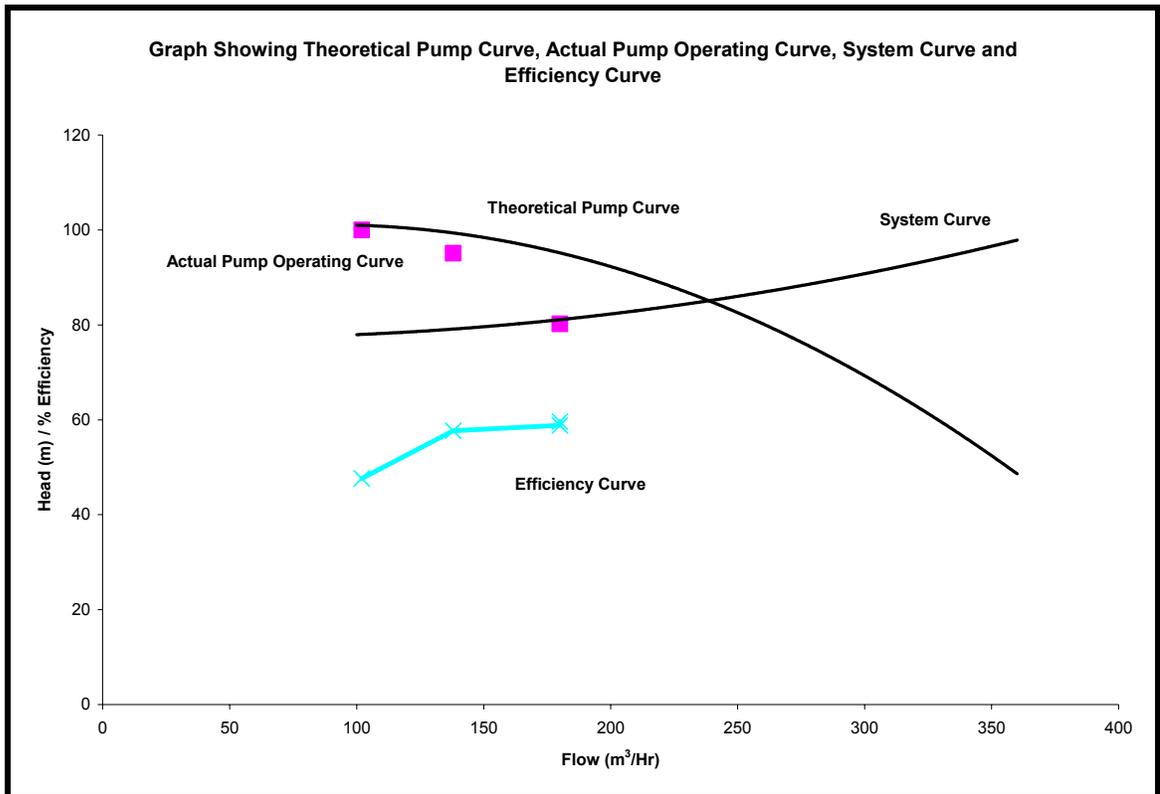
Dynamic Water Level: 40.7 m

Safe Yield: 315 m³/Hr

Installed Pump Hydraulic Capacity: 275 m³/Hr x 75 m x 75 kW

Pump Make: Caprari

Date Installed: 10-09-04



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 59.6%.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Labourdonnais BH 551A (CEB Acc:2C5741)

The Borehole characteristics are:

Borehole Depth: 84 m

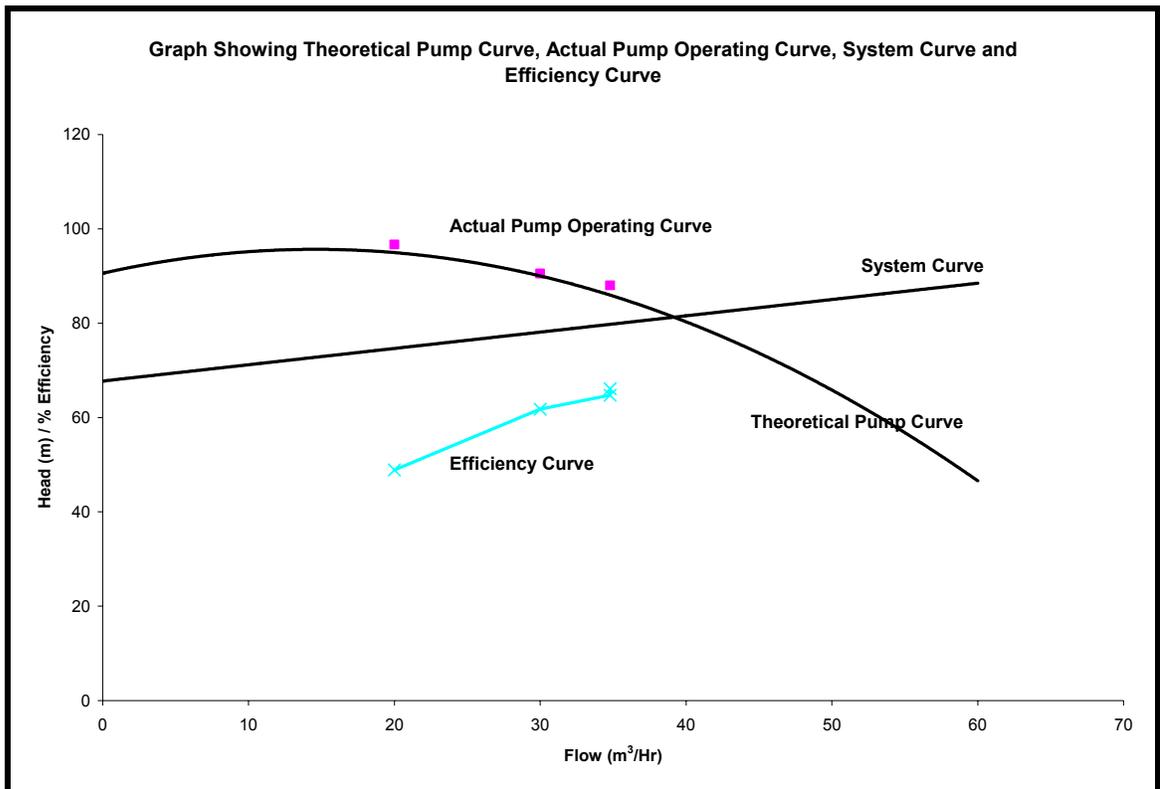
Dynamic Water Level: 61.37 m

Safe Yield: 42 m³/Hr

Installed Pump Hydraulic Capacity: 40 m³/Hr x 80 m x 15 kW

Pump Make: Caprari

Date Installed: 10-03-03



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 66.1%.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Mapou BH 558 (CEB Acc:6C7196)

The Borehole characteristics are:

Borehole Depth: 87 m

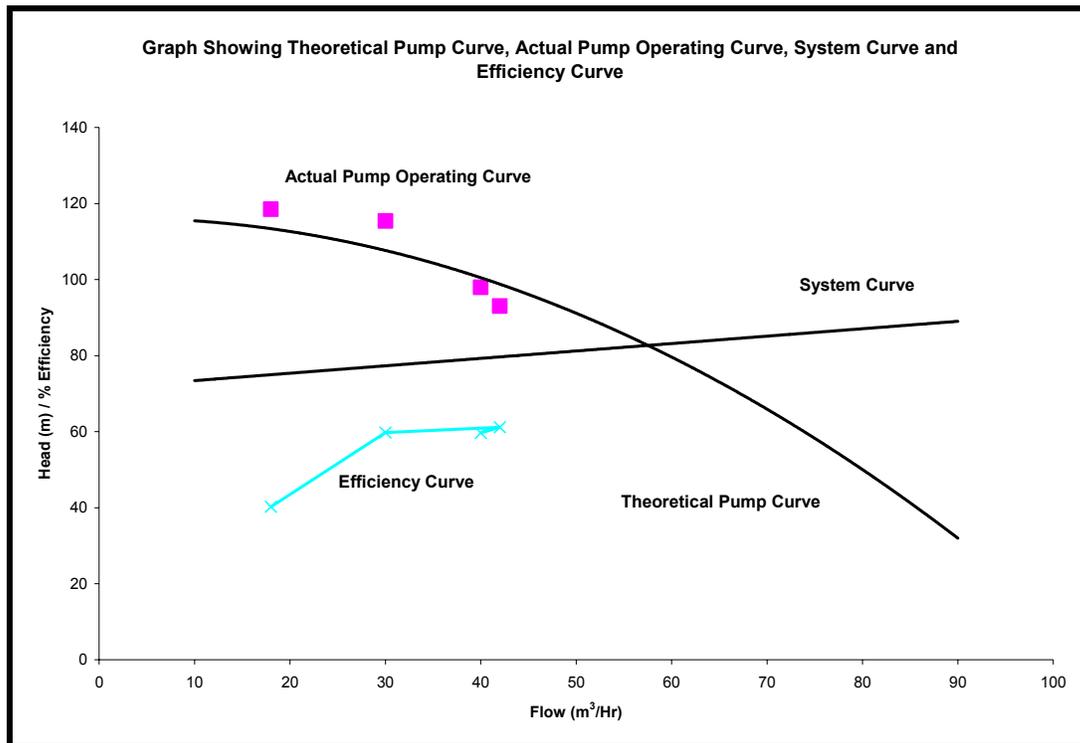
Dynamic Water Level: 54.73 m

Safe Yield: 65 m³/Hr

Installed Pump Hydraulic Capacity: 60 m³/Hr x 80 m x 22.4 kW

Pump Make: Caprari

Date Installed: 21-03-02



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above safe yield. The efficiency of the pump at its operational point is 59.7 %. This pump experienced failure on 15-03-06 and was replaced by a used pump rated at 75 m³/Hr x 75 m x 20 kW. However, the recommended pump at the safe yield, based on a pump efficiency of 70% and available motor rating would be 65 m³/Hr x 85 m x 22 kW

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Mon Loisir BH 720 (CEB Acc:2C6703)

The Borehole characteristics are:

Borehole Depth: 61.8 m

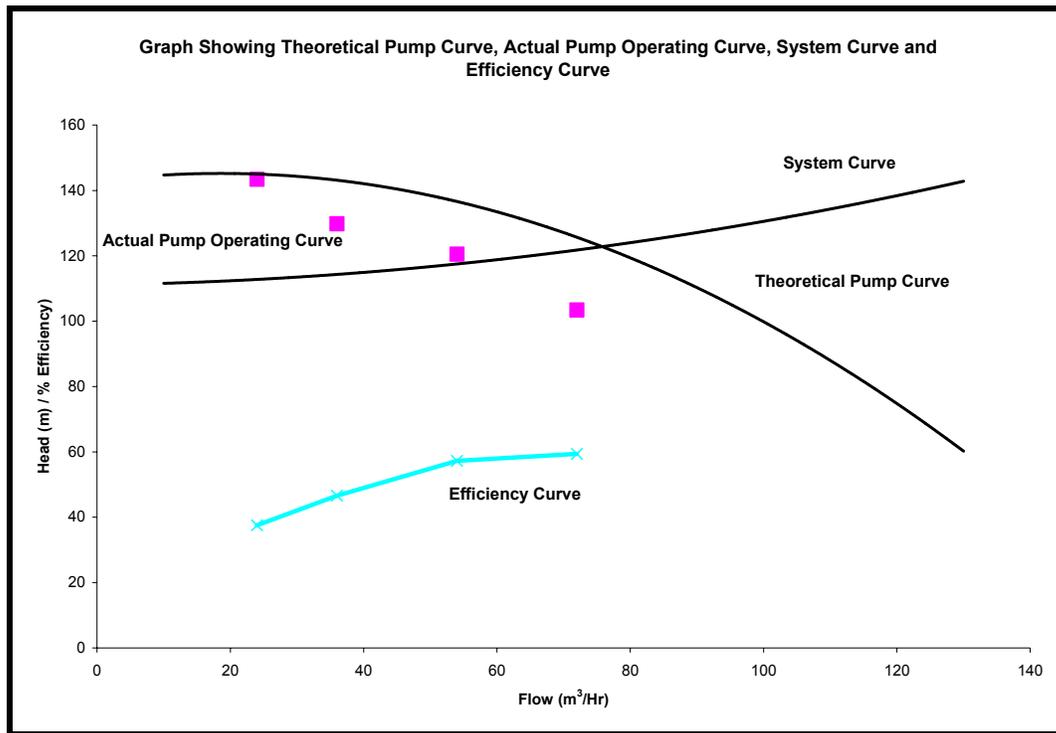
Dynamic Water Level: 40.43 m

Safe Yield: 100 m³/Hr

Installed Pump Hydraulic Capacity 90 m³/Hr x 100 m x 37 kW

Pump Make: Caprari

Date Installed: 23-11-01



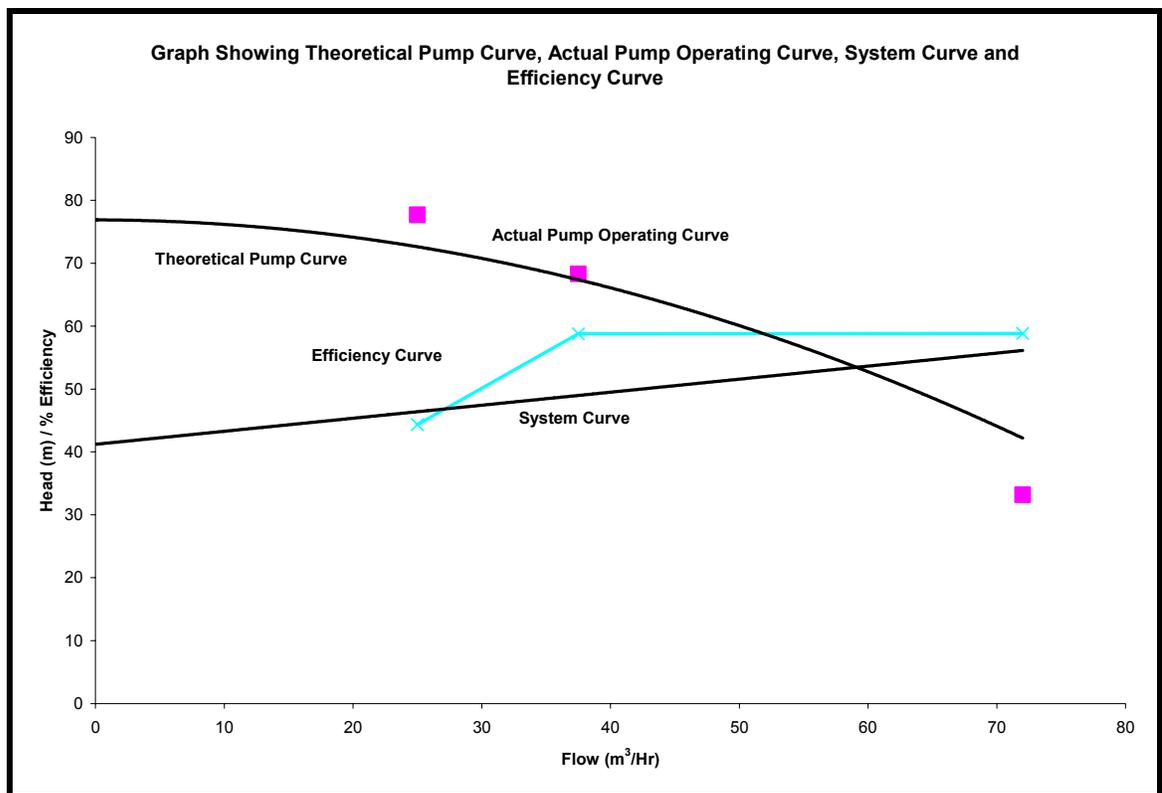
Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 59.4%. This borehole is underexploited as the requirement for the distribution line is below the borehole yield.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Morcellement St Andre BH 117A& B (CEB Acc: 6C3521)

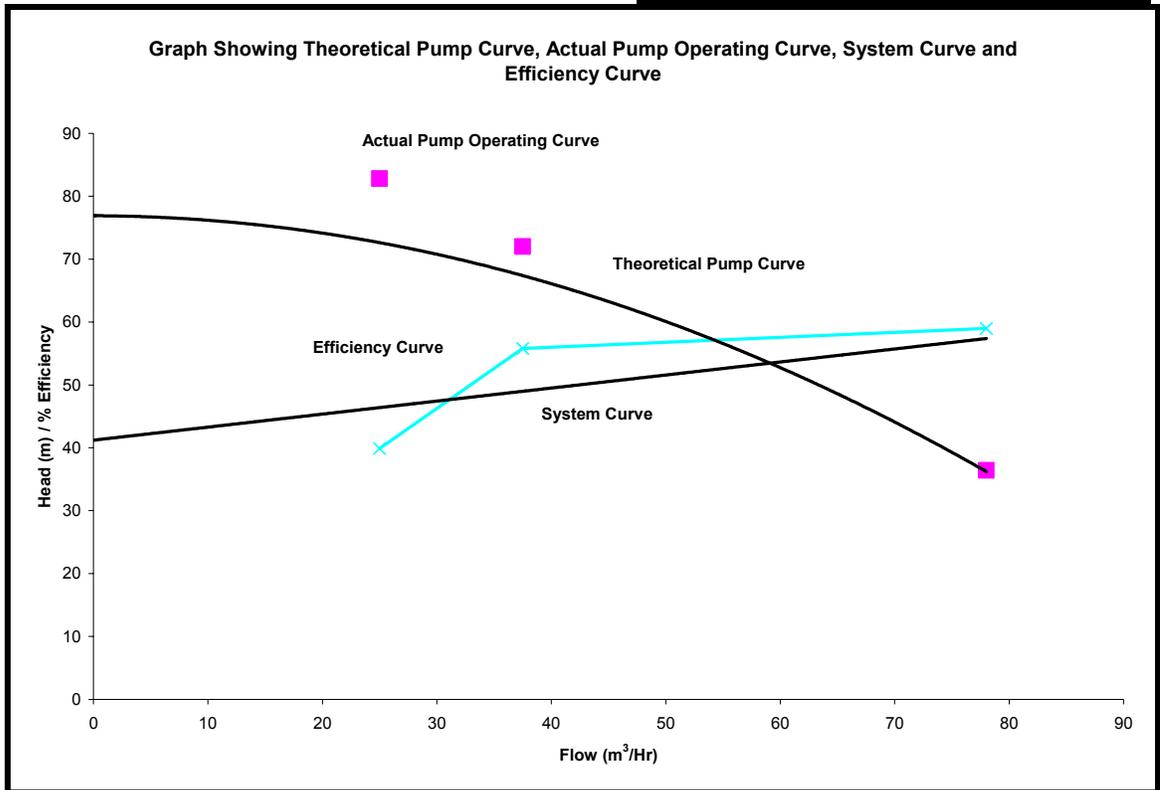
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 117A	BH117B
Borehole Depth:	58 m	55 m
Dynamic Water Level:	21.4 m	16.79 m
Safe Yield:	66 m ³ /Hr	66 m ³ /Hr
Installed Pump Hydraulic Capacity:	50 m ³ /Hr x 60 m x 22 kW	50 m ³ /Hr x 60 m x 18.5 kW
Pump Make:	Grundfos	Grundfos
Date Installed	09-06-99	18-05-99



Morc 117A

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***



Morc 117B

Based on tests,

- For Morc 117A it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve and the intersection between the system curve and theoretical pump is near the safe yield. The efficiency of the pump at its operational point is 58.8%.
- For Morc 117B it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. the intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 59%.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Morcellement St Andre BH 306 (CEB Acc:6C2798)

The Borehole characteristics are:

Borehole Depth: 26.2 m

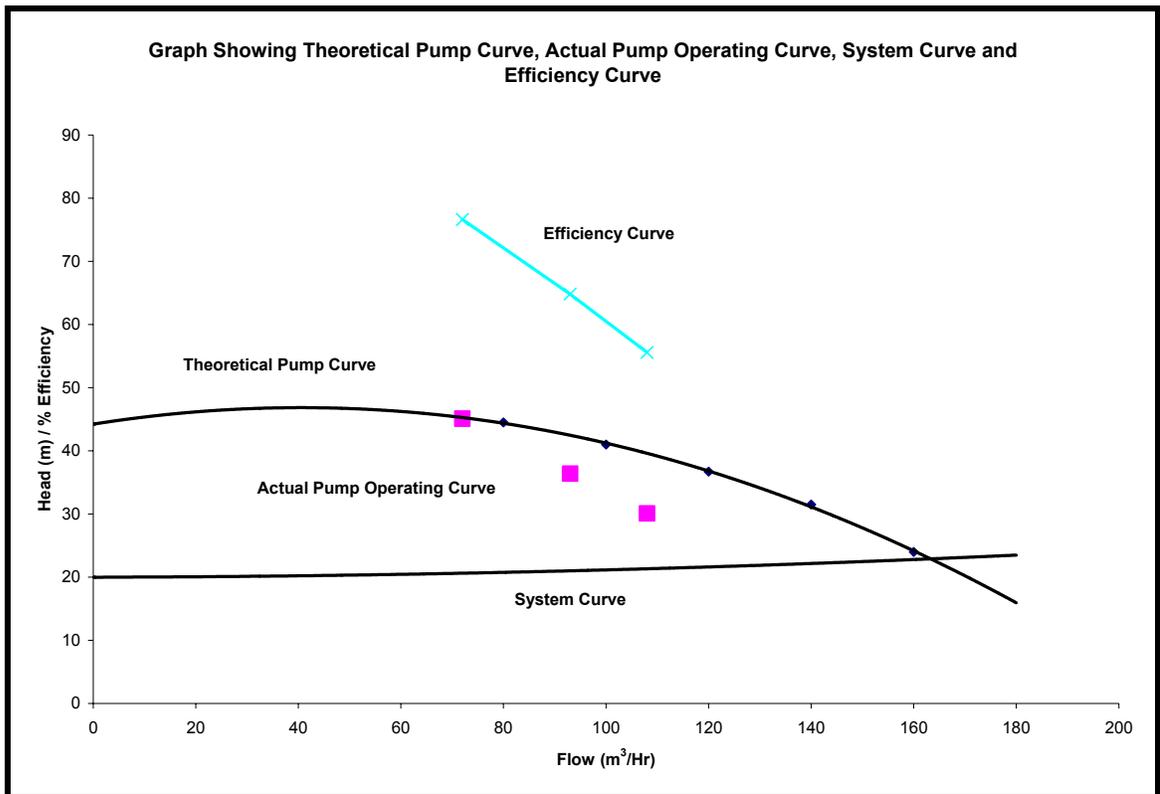
Dynamic Water Level: 22.57

Safe Yield: 144 m³/Hr

Installed Pump Hydraulic Capacity: 125 m³/Hr x 32 m x 18.5 kW

Pump Make: Caprari

Date Installed: 22-10-03



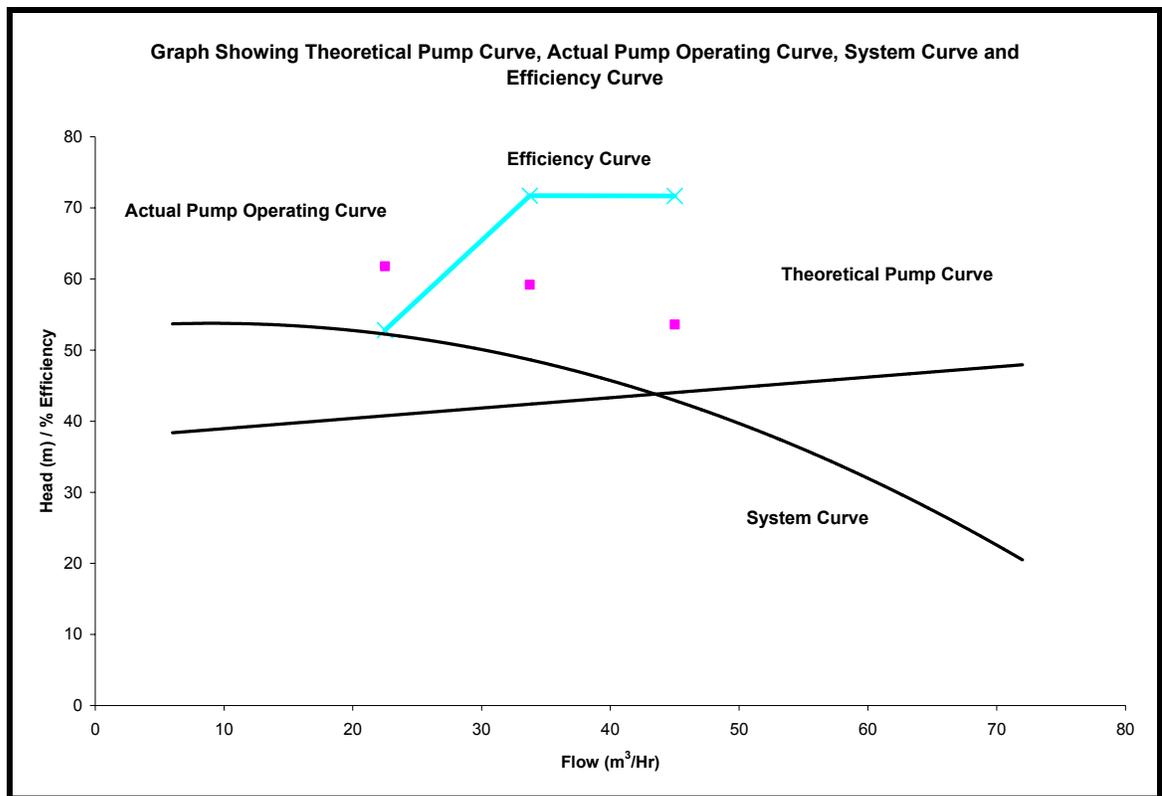
Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 55.6%.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Morcellement St Andre BH 309 A& B (CEB Acc:6C3523)

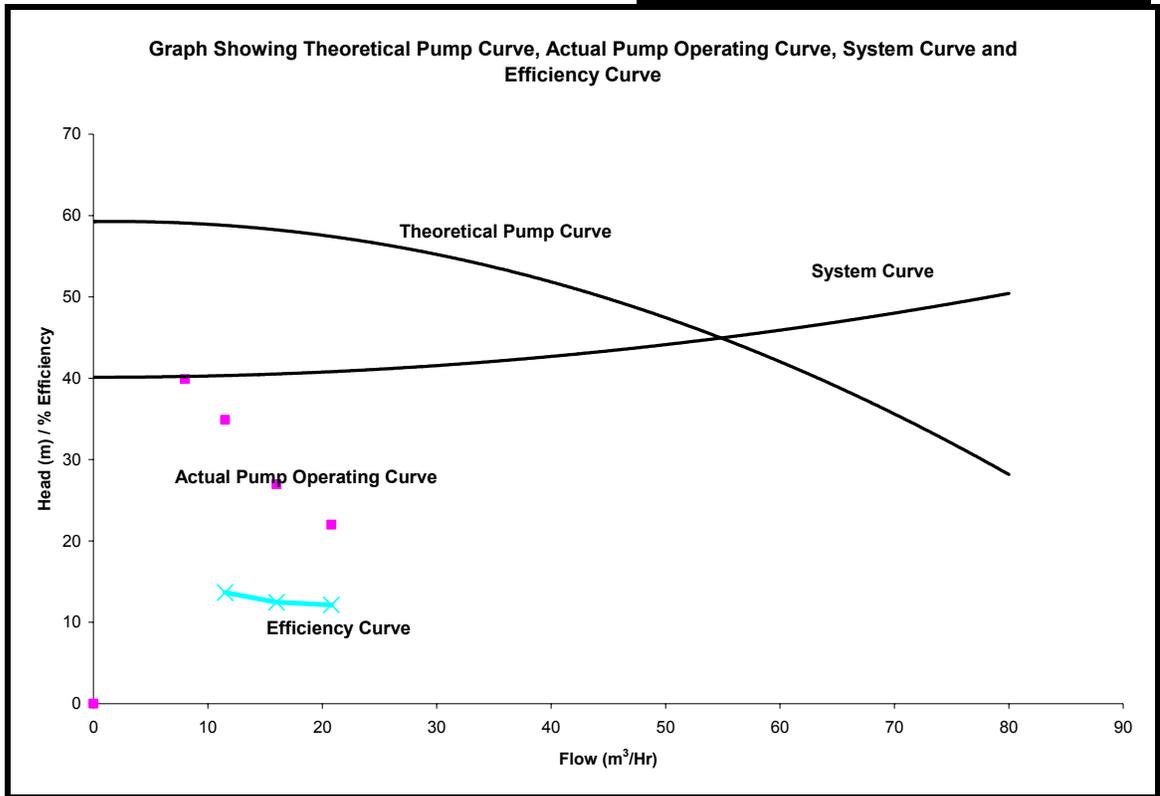
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 309A	BH309B
Borehole Depth:	72 m	63 m
Dynamic Water Level:	39.6	14.2
Safe Yield:	42 m ³ /Hr	42 m ³ /Hr
Installed Pump Hydraulic Capacity:	45 m ³ /Hr x 40 m x 11 kW	25 m ³ /Hr x 40 m x 9.2 kW
Pump Make:	Jetspa	Caprari
Date Installed	16-02-02	16-08-05



Morc 309A

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***



Morc 309B

Based on tests,

- For BH 309A it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 71.7%. The Installed Pump Hydraulic Capacity's motor is overrated and based on a pump efficiency of 70% and available motor rating a pump of rating 45 m³/Hr x 40 m x 7.5 kW is recommended
- For BH 309B it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 12.1% the Installed Pump Hydraulic Capacity's motor is overrated and based on a pump efficiency of 70% and available motor rating a pump of rating 45 m³/Hr x 40 m x 7.5 kW is recommended

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Piton Bon Espoir BH 820 (CEB Acc:2C7420)

The Borehole characteristics are:

Borehole Depth: 133 m

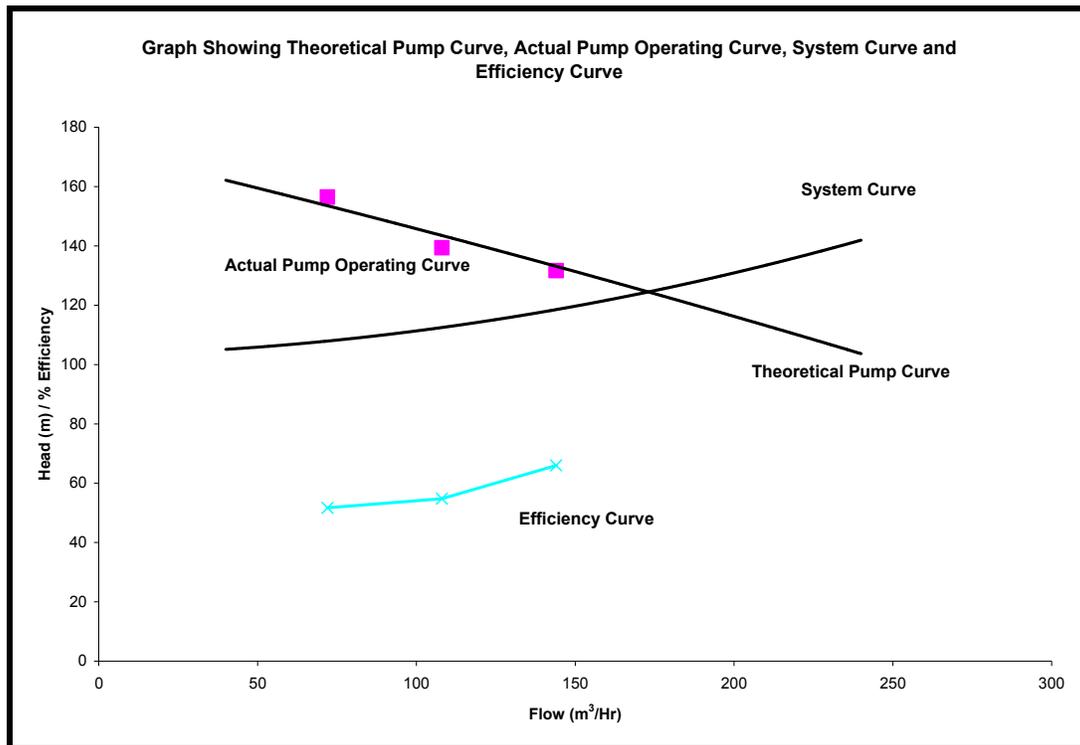
Dynamic Water Level: 84

Safe Yield: 194 m³/Hr

Installed Pump Hydraulic Capacity: 240 m³/Hr x 100 m x 92 kW

Pump Make: Caprari

Date Installed: 25-04-03



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 65.99%.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Poudre D’Or BH 752 (CEB Acc:2C7137)

The Borehole characteristics are:

Borehole Depth: 99 m

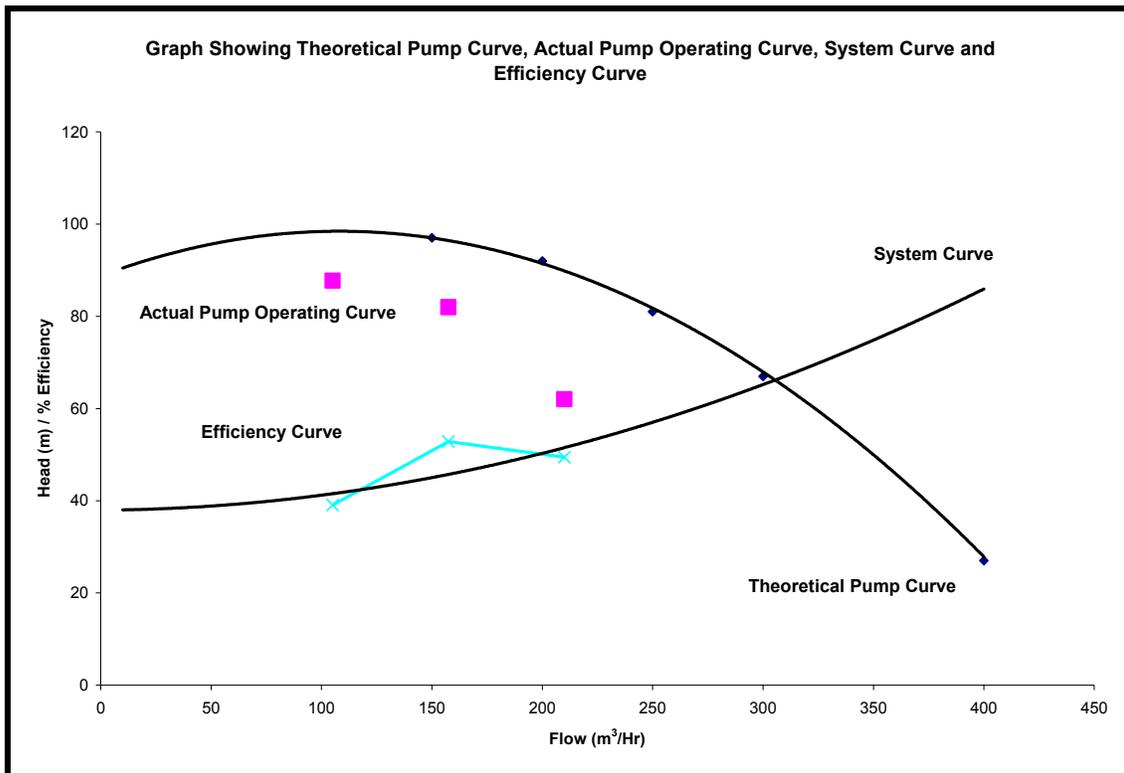
Dynamic Water Level: 30

Safe Yield: 270 m³/Hr

Installed Pump Hydraulic Capacity: 306 m³/Hr x 70 m x 75 kW

Pump Make: Caprari

Date Installed: 11-01-00



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above the safe yield. The efficiency of the pump at its operational point is 49.43%. Based on a pump efficiency of 70% and available motor rating a pump of rating 270 m³/Hr x 60 m x 65 kW is recommended

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Poudre D’Or BH 123(i) (CEB Acc:2M0382)

The Borehole characteristics are:

Borehole Depth: 54 m

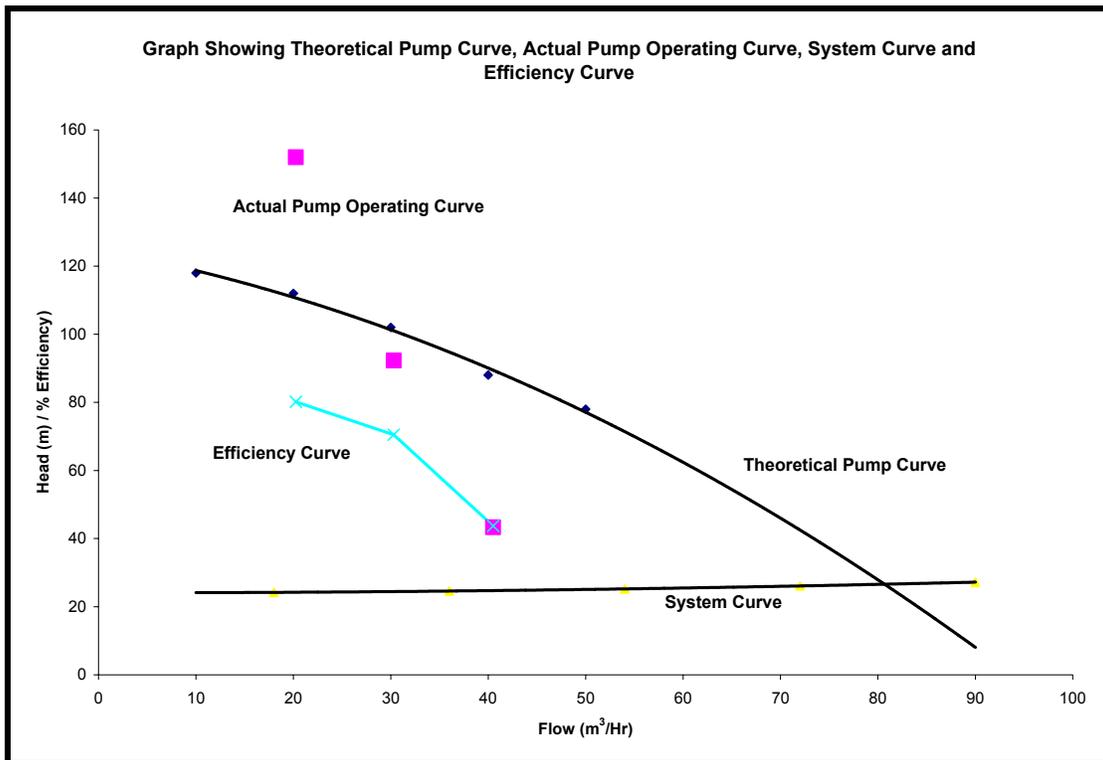
Dynamic Water Level: 37.96

Safe Yield: 66 m³/Hr

Installed Pump Hydraulic Capacity: 50 m³/Hr x 60 m x 15 kW

Pump Make: Super D

Date Installed: 03-11-97



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above the safe yield. The efficiency of the pump at its operational point is 43.7%. Based on a pump efficiency of 70% and available motor rating a pump of rating 60 m³/Hr x 40 m x 11 kW is recommended

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Poudre D’Or BH 123(ii) (CEB Acc:2C4592)

The Borehole characteristics are:

Borehole Depth: 50.6 m

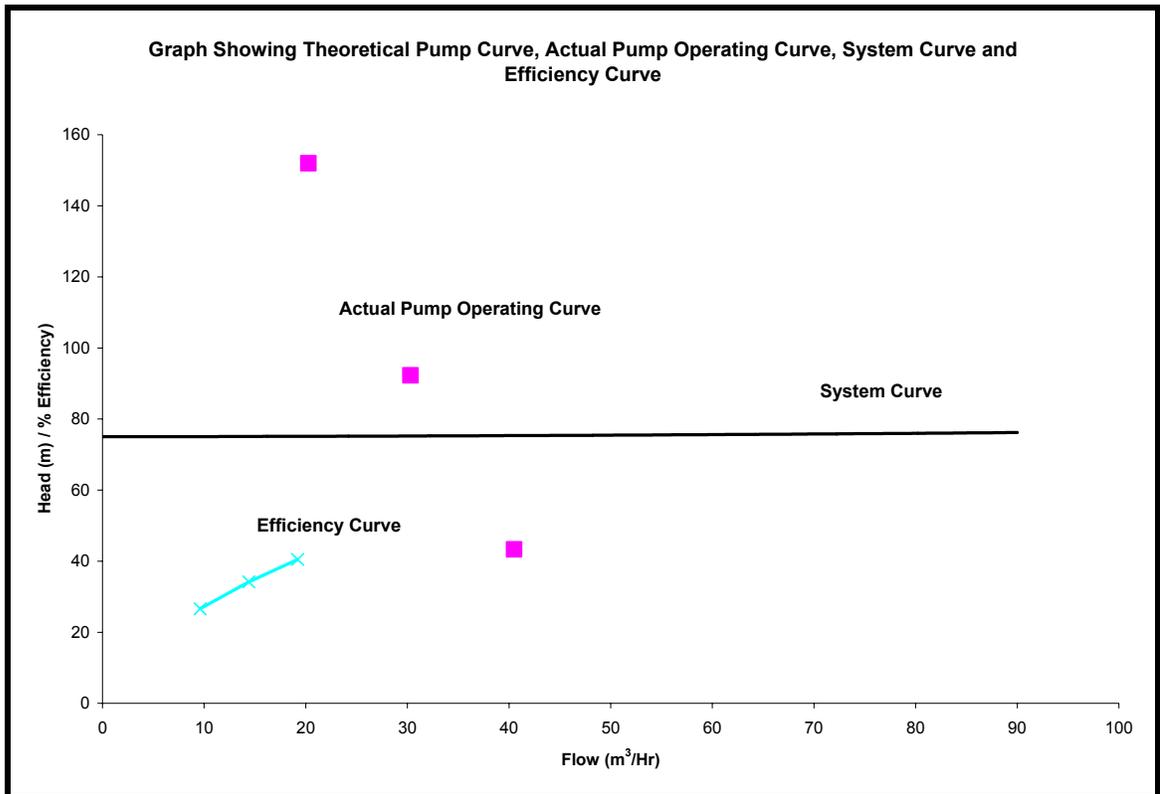
Dynamic Water Level: 22.76

Safe Yield: 72 m³/Hr

Installed Pump Hydraulic Capacity: 37 m³/Hr x 50 m x 9.3 kW

Pump Make: KSB

Date Installed: 1999



The theoretical pump curve is not available for this pump. The efficiency of the pump at its operational point is 40.47%. The recommended pump at the safe yield, based on a pump efficiency of 70% and available motor rating would be 72 m³/Hr x 80 m x 22 kW

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Poudre D’Or BH 123(iii) (CEB Acc:2C2308)

The Borehole characteristics are:

Borehole Depth: 34 m

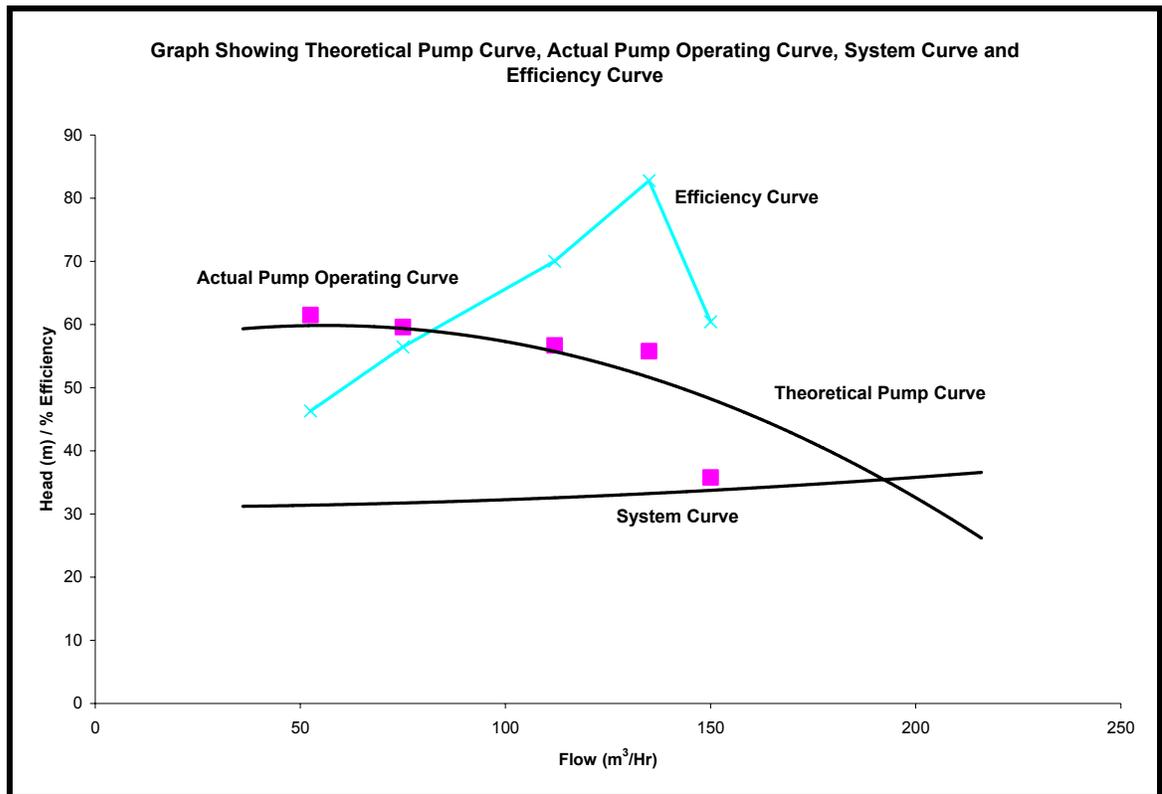
Dynamic Water Level: 25.54

Safe Yield: 120 m³/Hr

Installed Pump Hydraulic Capacity: 180 m³/Hr x 40 m x 26 kW

Pump Make: Caprari

Date Installed: 28-02-01



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above the safe yield. The efficiency of the pump at its operational point is 82.7%. Based on a pump efficiency of 70% and available motor rating a pump of rating 120 m³/Hr x 40 m x 18 kW is recommended.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Poudre D’Or BH 123(iv) (CEB Acc:2C4281)

The Borehole characteristics are:

Borehole Depth: 41.3 m

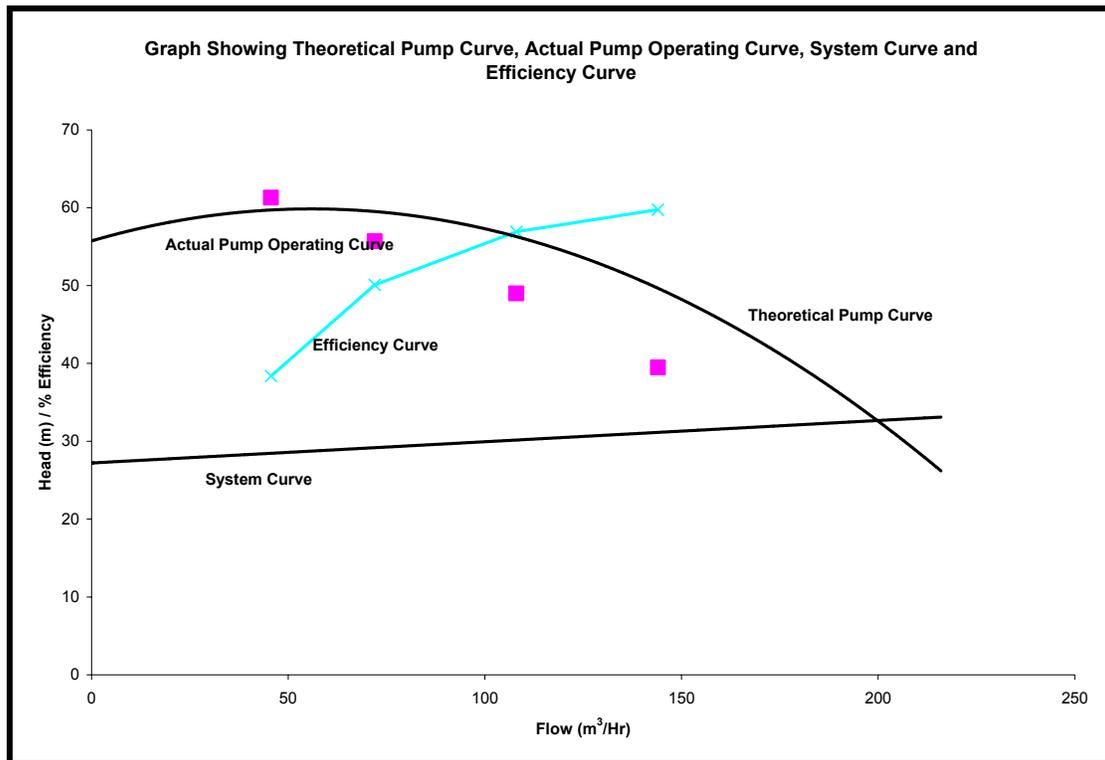
Dynamic Water Level: 23.3

Safe Yield: 156 m³/Hr

Installed Pump Hydraulic Capacity: 180 m³/Hr x 40 m x 30 kW

Pump Make: Caprari

Date Installed: 30-06-97



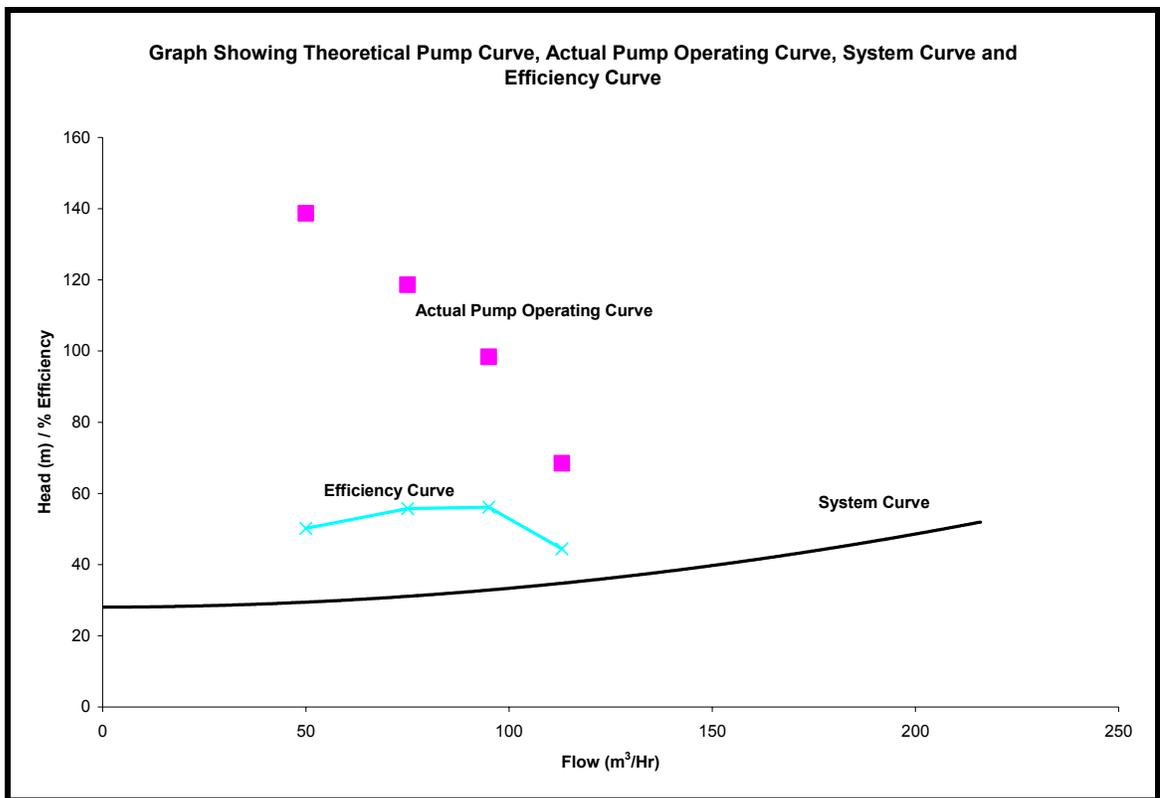
Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above the safe yield. The efficiency of the pump at its operational point is 59.74%. Based on a pump efficiency of 70% and available motor rating a pump of rating 156 m³/Hr x 40 m x 26 kW is recommended

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Petite Retraite BH 1 (CEB Acc:2C2849)

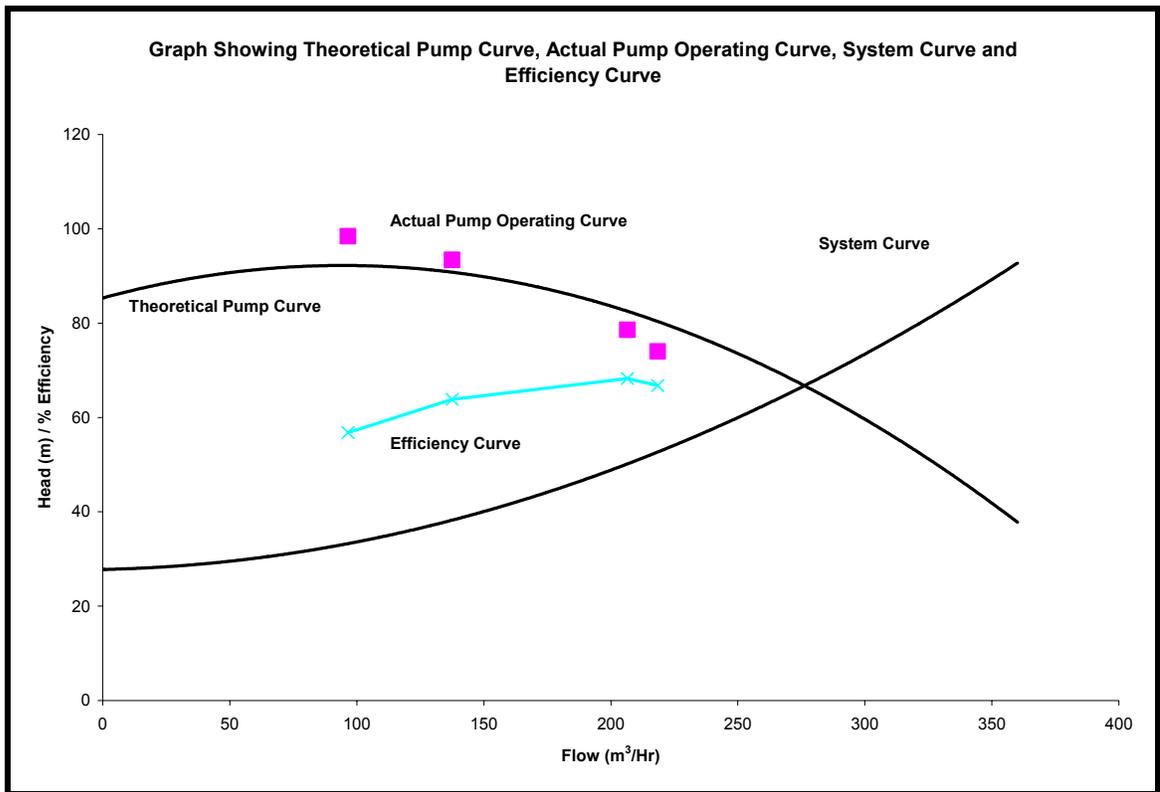
This site has two boreholes which are operated simultaneously. The Borehole characteristics are:

	BH 1	BH2
Borehole Depth:	34.6 m	41 m
Dynamic Water Level:	26	30.2
Safe Yield:	210 m ³ /Hr	210 m ³ /Hr
Installed Pump Hydraulic Capacity:	150 m ³ /Hr x 80 m x 45 kW	275 m ³ /Hr x 65 m x 66 kW
Pump Make:	Caprari	Caprari
Date Installed	6-12-94	11-04-00



Petite Retraite No 1

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II



Petite Retraite No 2

Based on tests,

- For Petite Retraite BH 1, the theoretical pump curve is not available. The efficiency of the pump at its operational point is 44.42%. The required pump based on a pump efficiency of 70% and available motor rating a pump of rating 210 m³/Hr x 40 m x 32 kW is recommended
- For Petite Retraite BH 2 it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 68% the Installed Pump Hydraulic Capacity's motor is overrated and based on a pump efficiency of 70% and available motor rating a pump of rating 210 m³/Hr x 40 m x 32 kW is recommended

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Riche Terre BH 36 (CEB Acc:)

The Borehole characteristics are:

Borehole Depth: 36 m

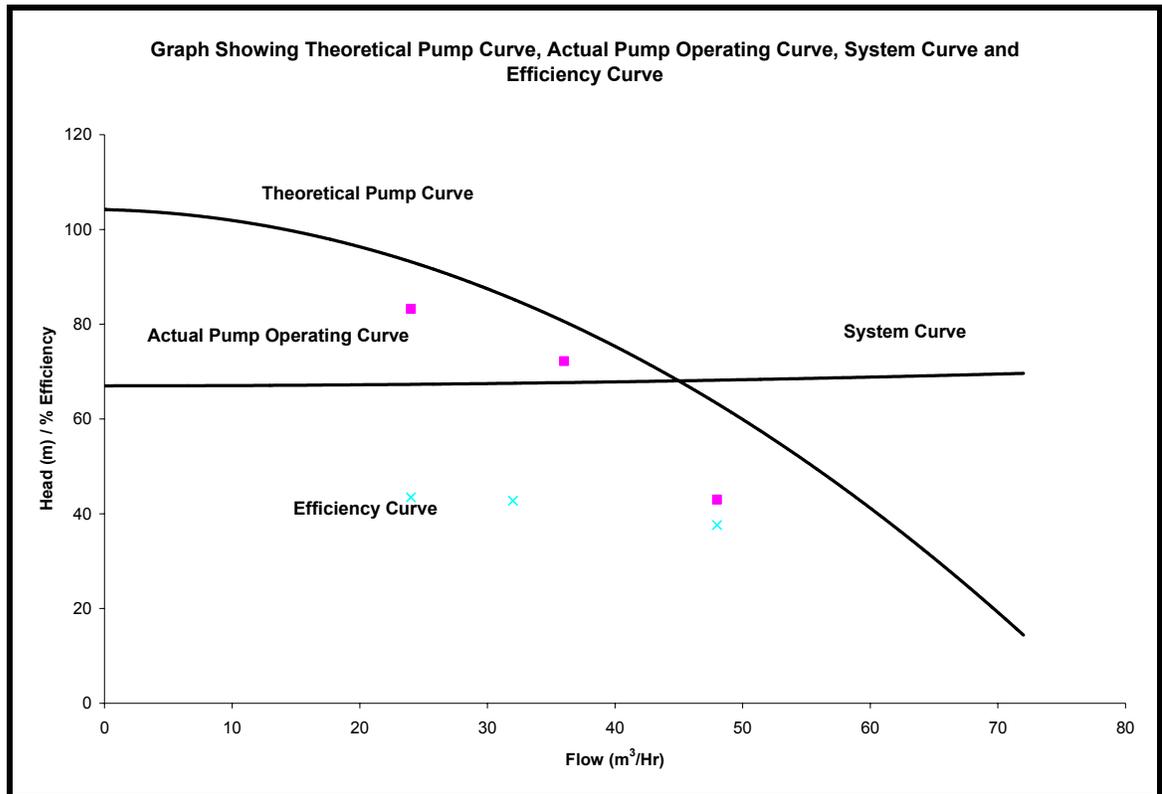
Dynamic Water Level: 34.21

Safe Yield: 60 m³/Hr

Installed Pump Hydraulic Capacity: 50 m³/Hr x 60 m x 15 kW

Pump Make: Rovatti

Date Installed: 28-01-02



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 37.7%. The recommended pump at the safe yield, based on a pump efficiency of 70% and available motor rating would be 60 m³/Hr x 70 m x 18 kW

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

New Schoenfeld BH 337A (CEB Acc:2C4322)

The Borehole characteristics are:

Borehole Depth: 33.83 m

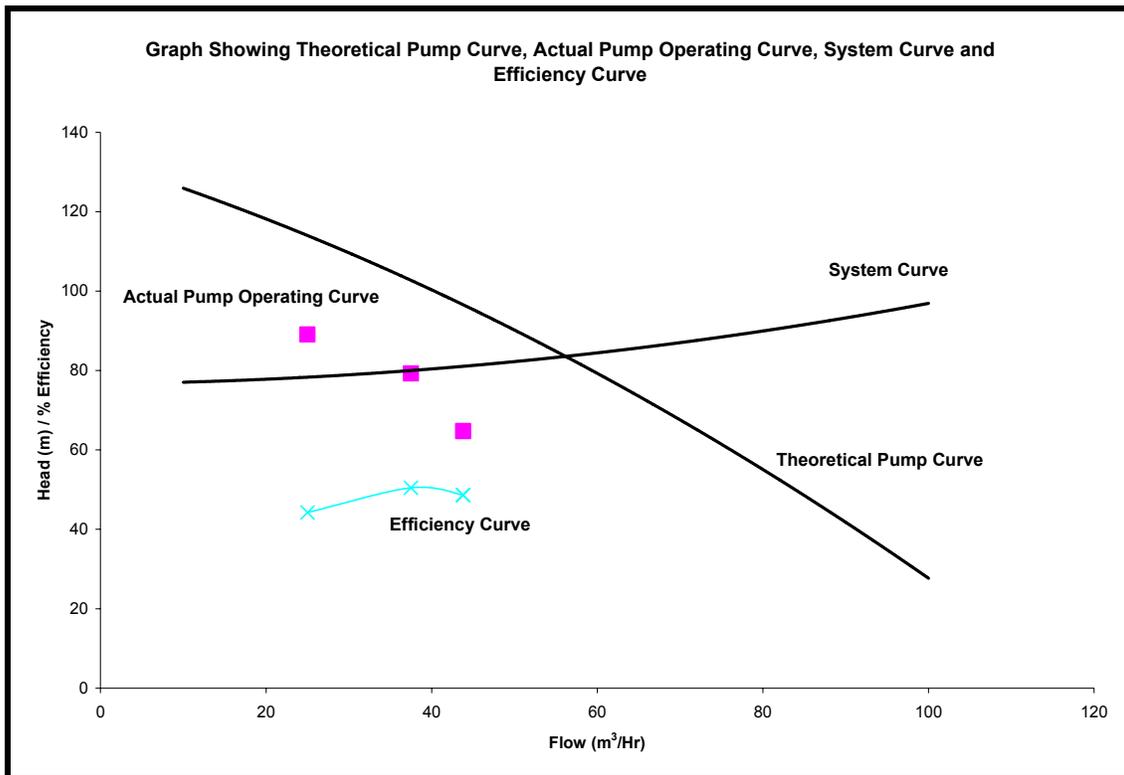
Dynamic Water Level: 11.53

Safe Yield: 96 m³/Hr

Installed Pump Hydraulic Capacity: 50 m³/Hr x 80 m x 18.5 kW

Pump Make: Caprari

Date Installed: 13-11-03



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well below the safe yield. The efficiency of the pump at its operational point is 48.7%. This pump operates directly on the distribution line and the required flow is only 50m³/hr. At this flow, the Installed Pump Hydraulic Capacity is appropriate.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

New Schoenfeld BH 337 (CEB Acc:)

The Borehole characteristics are:

Borehole Depth: 32.4 m

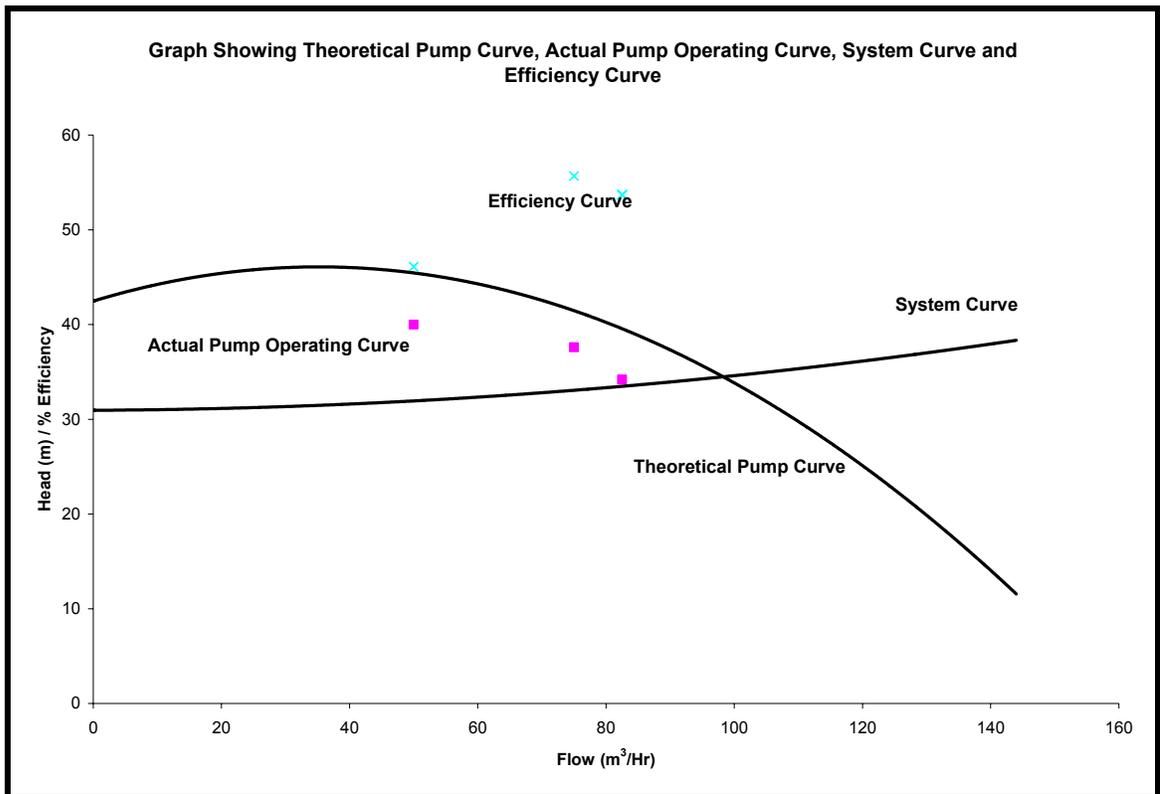
Dynamic Water Level: 19.4

Safe Yield: 96 m³/Hr

Installed Pump Hydraulic Capacity: 130 m³/Hr x 30 m x 15 kW

Pump Make: Caprari

Date Installed: 10-09-01



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 53.7%.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Solitude BH 748 (CEB Acc: 6C7044)

The Borehole characteristics are:

Borehole Depth: 112 m

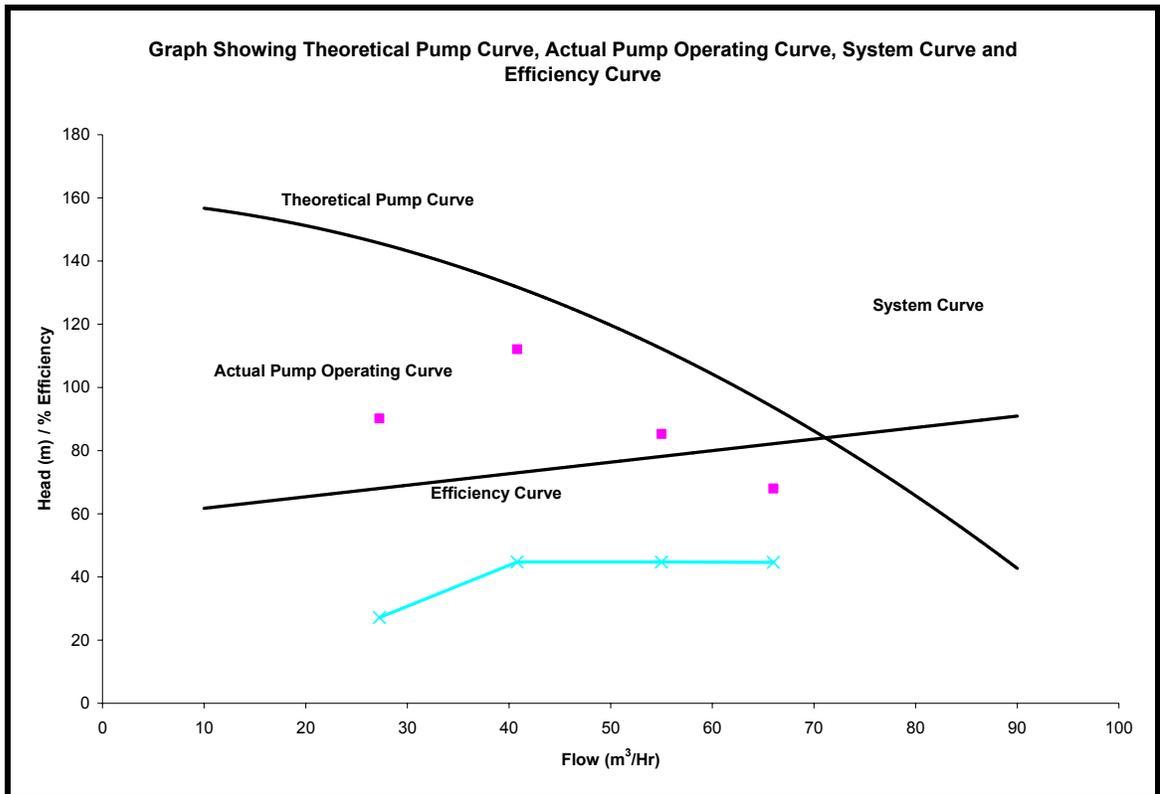
Dynamic Water Level: 32m

Safe Yield: 80 m³/Hr

Installed Pump Hydraulic Capacity: 55 m³/Hr x 110 m x 26 kW

Pump Make: Rovatti

Date Installed: 28-08-02



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 44.6%. The recommended pump at the safe yield, based on a pump efficiency of 70% and available motor rating would be 80 m³/Hr x 90 m x 28 kW

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

2.33 Analysis for DWS – East system

Bel Etang BH 538 (CEB Acc: 4C4910)

The Borehole characteristics are:

Borehole Depth: 58 m

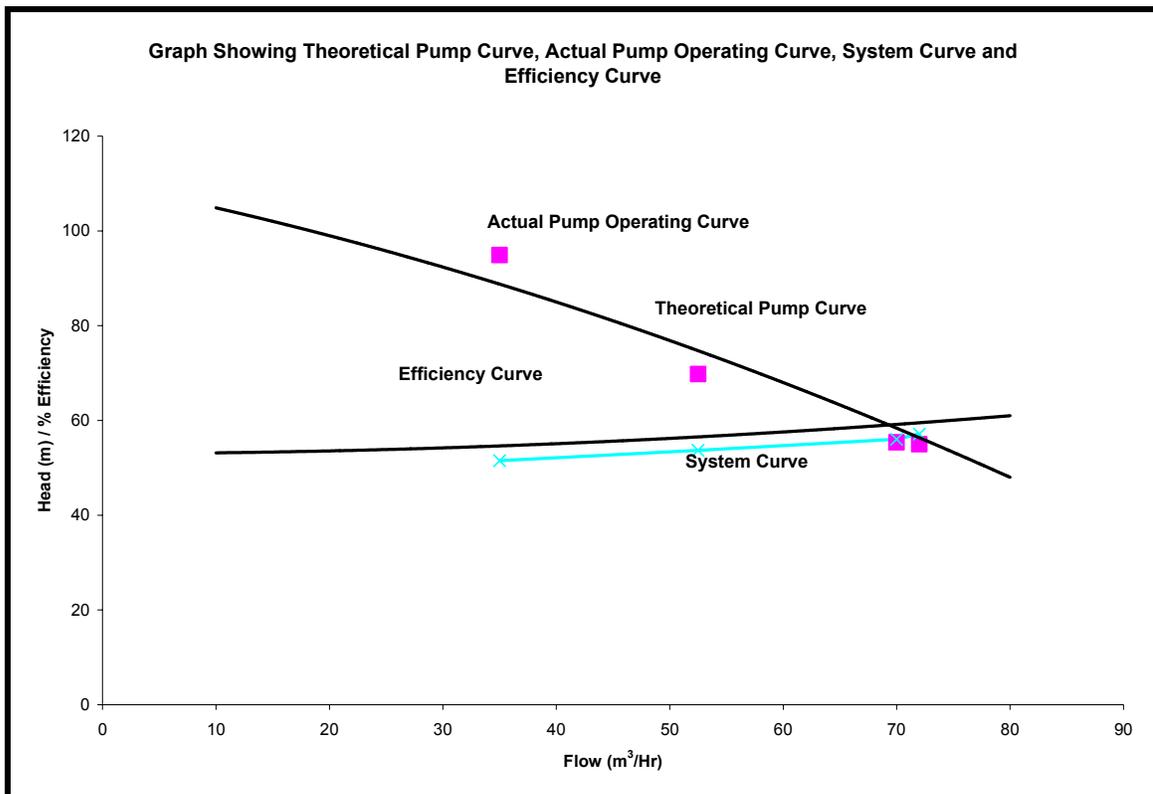
Dynamic Water Level: 23

Safe Yield: 70 m³/Hr

Installed Pump Hydraulic Capacity: 70 m³/Hr x 60 m x 18.6 kW

Pump Make: Super D

Date Installed: 31-03-97



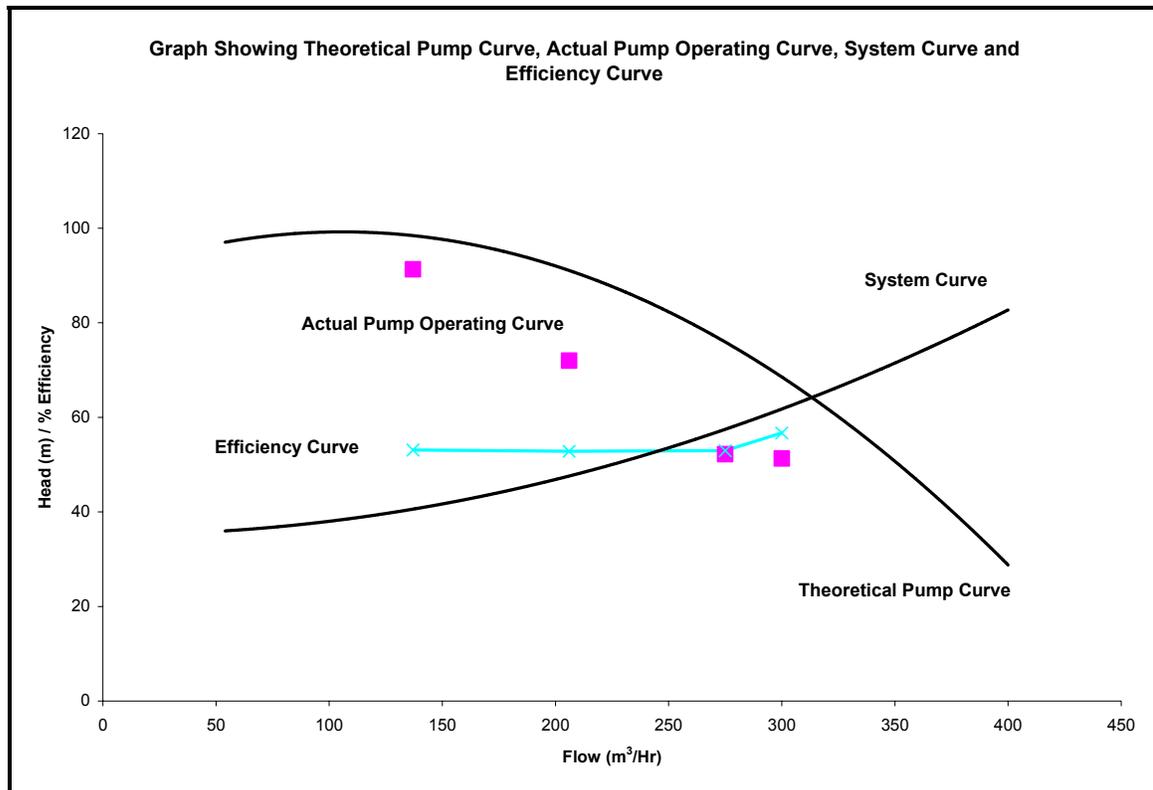
Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 57.14%.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Bonne Mere BH 492 A & B (CEB Acc:2C3357)

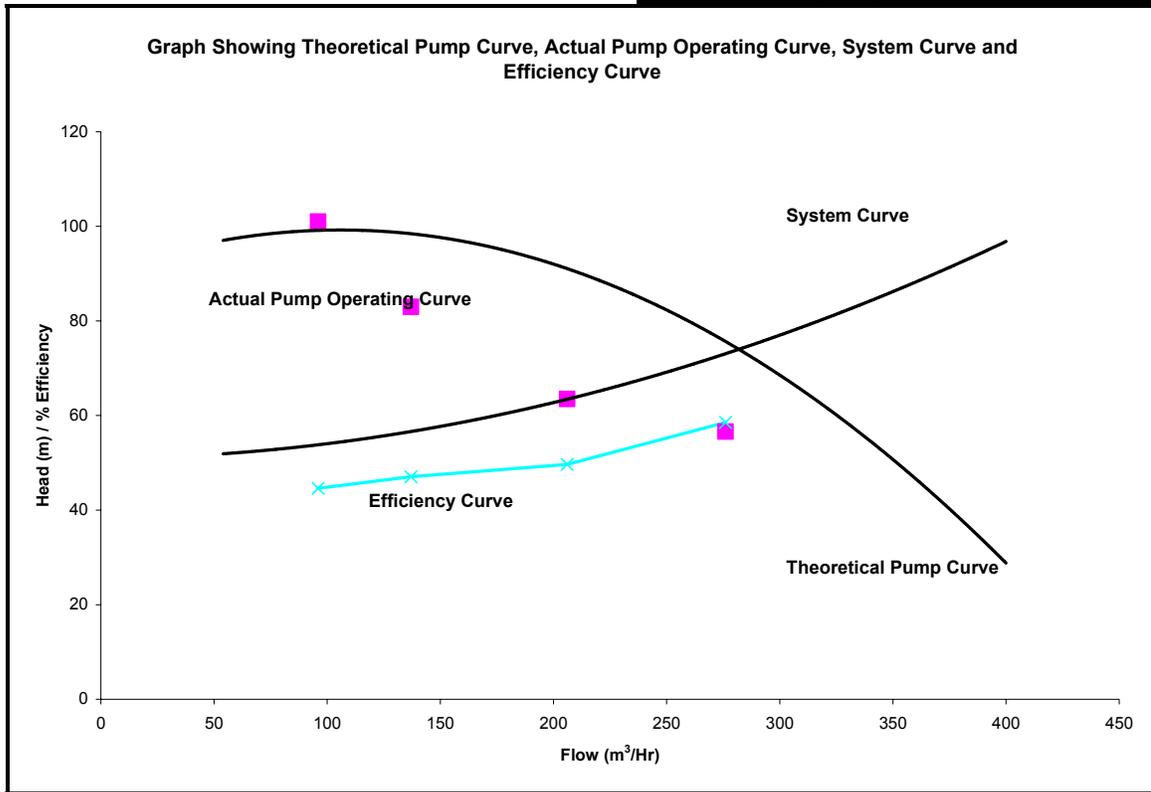
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 492A	BH492B
Borehole Depth:	39,5 m	47.24 m
Dynamic Water Level:	34.5	25.64
Safe Yield:	210 m ³ /Hr	150 m ³ /Hr
Installed Pump Hydraulic Capacity:	275 m ³ /Hr x 75 m x 75 kW	275 m ³ /Hr x 75 m x 75 kW
Pump Make:	Caprari	Caprari
Date Installed	16-08-05	06-10-98



Test Results for Borehole 492A

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***



Test Results for Borehole 492B

Based on tests, it is found that for both boreholes, the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. Moreover, the intersection between the system curve and theoretical pump curve is well above safe yield. The efficiency of the pump for Borehole 492A at its operational point is 58.54% and that of Borehole 492B is 56.7% and is acceptable. This site has been continuously producing above 270 m³/Hr without any drastic drop in the Dynamic Water Level. The recommended pump at this flow would be 270 m³/Hr x 60 m x 66 kW.

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CWA – Pumping Stations- Phase II**

Camp Ithier BH 815 (CEB Acc:2C7848)

The Borehole characteristics are:

Borehole Depth: 122 m

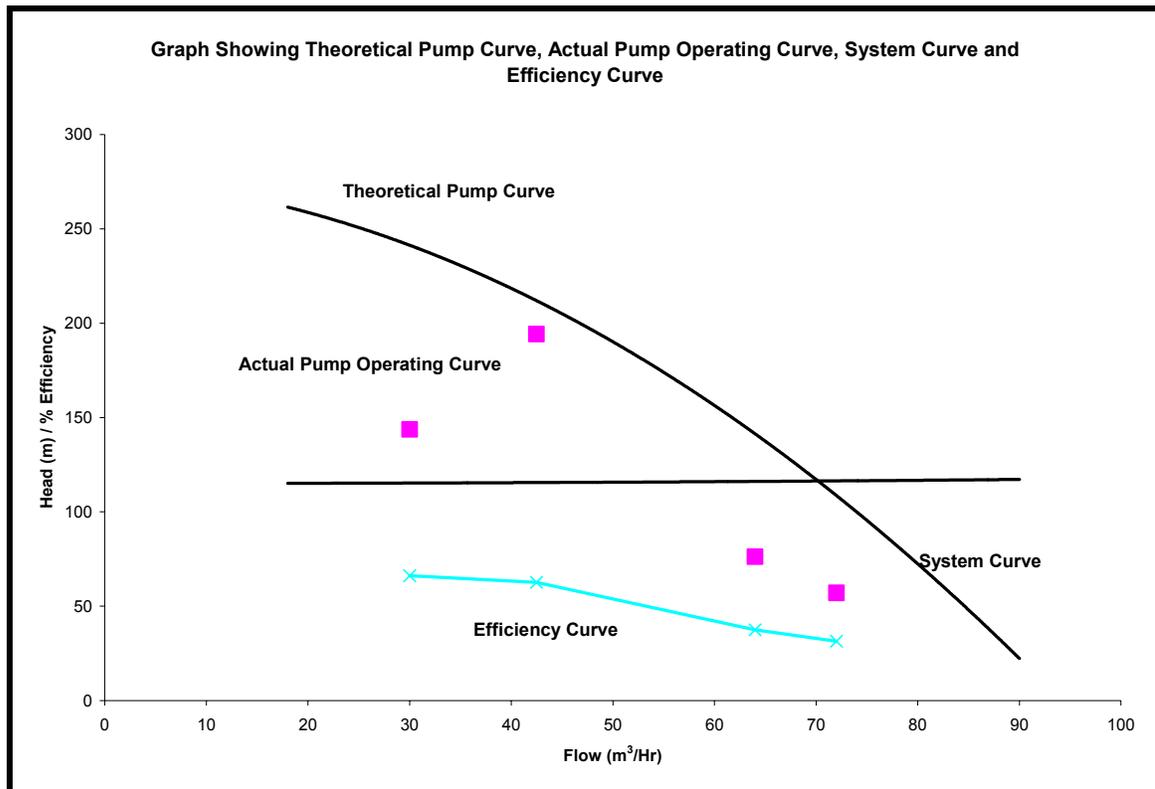
Dynamic Water Level: 59.6

Safe Yield: 85 m³/Hr

Installed Pump Hydraulic Capacity: 85 m³/Hr x 125 m x 37 kW

Pump Make: Caprari

Date Installed: 21-02-02



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 31.4%. The Installed Pump Hydraulic Capacity has an underrated motor and can lead to pump failure. Based on a pump efficiency of 70% and available motor rating a pump of rating 85 m³/Hr x 125 m x 45 kW is recommended

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Caroline BH 44A (CEB Acc:2C1937)

The Borehole characteristics are:

Borehole Depth: 32 m

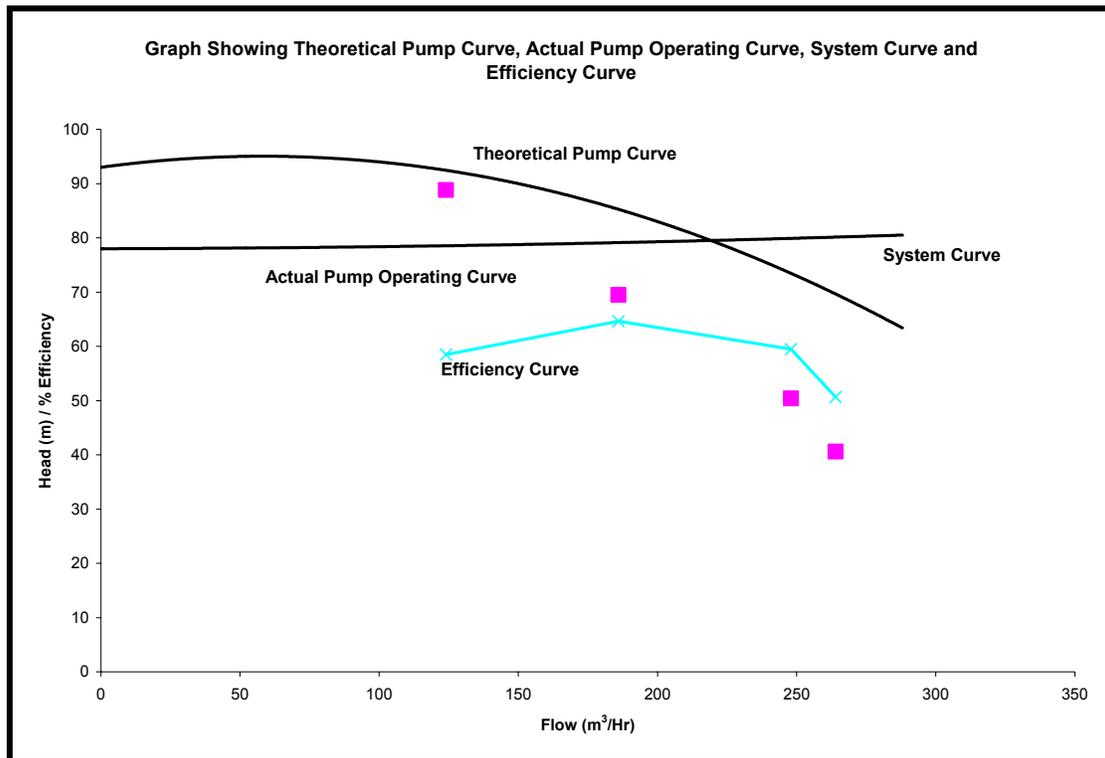
Dynamic Water Level: 10.99

Safe Yield: 220 m³/Hr

Installed Pump Hydraulic Capacity: 229 m³/Hr x 66 m x 66 kW

Pump Make: Caprari

Date Installed: 23-03-99



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. However, the intersection between the system curve and theoretical pump curve is near its safe yield. The efficiency of the pump at its operational point is 50.67% which is acceptable. This delivery head of the pump is underrated. The recommended pump at the safe yield, based on a pump efficiency of 70% and available motor rating would be 220 m³/Hr x 80 m x 70 kW.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Caroline BH 44B (CEB Acc: 2C1937)

The Borehole characteristics are:

Borehole Depth: 34 m

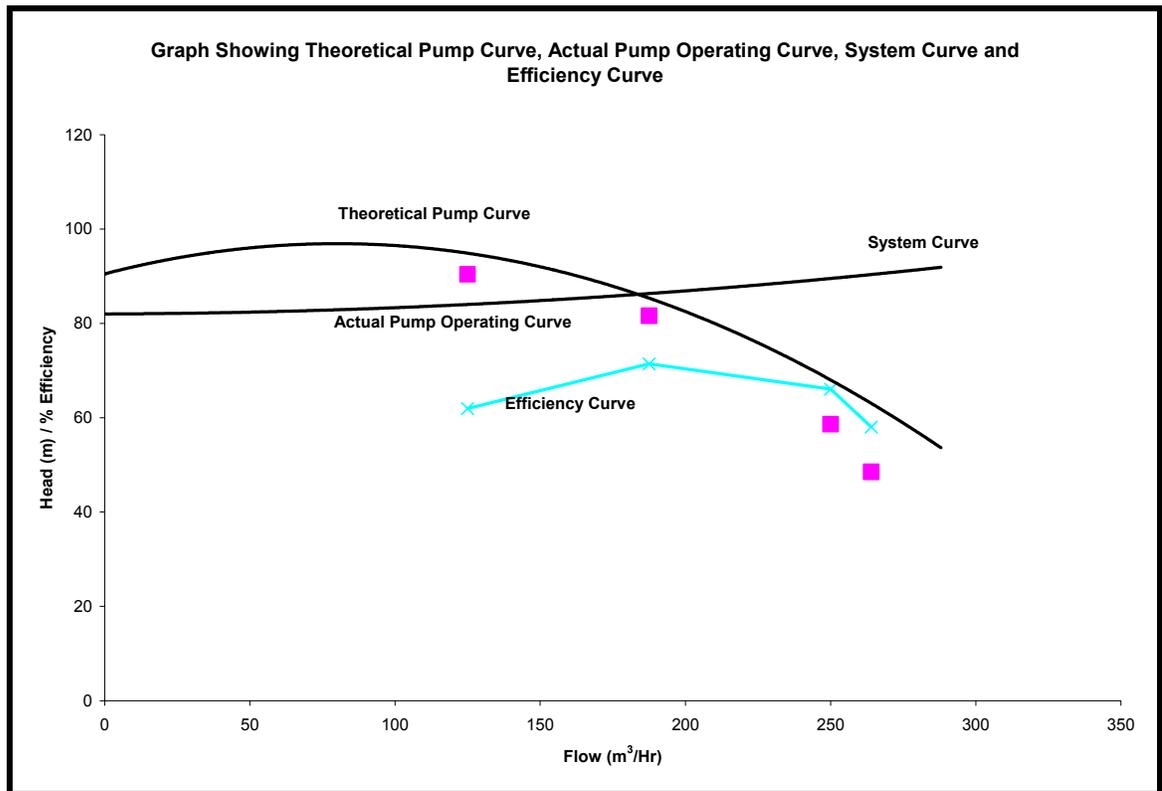
Dynamic Water Level: 14.32

Safe Yield: 240 m³/Hr

Installed Pump Hydraulic Capacity: 250 m³/Hr x 65 m x 59 kW

Pump Make: Caprari

Date Installed: 27-03-02



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. However, the intersection between the system curve and theoretical pump curve is near its safe yield. The efficiency of the pump at its operational point is 58.01%. This delivery head of the pump is underrated. The recommended pump at the safe yield, based on a pump efficiency of 70% and available motor rating would be 240 m³/Hr x 90 m x 84 kW.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Laventure BH 11A (CEB Acc:)

The Borehole characteristics are:

Borehole Depth: 39.6 m

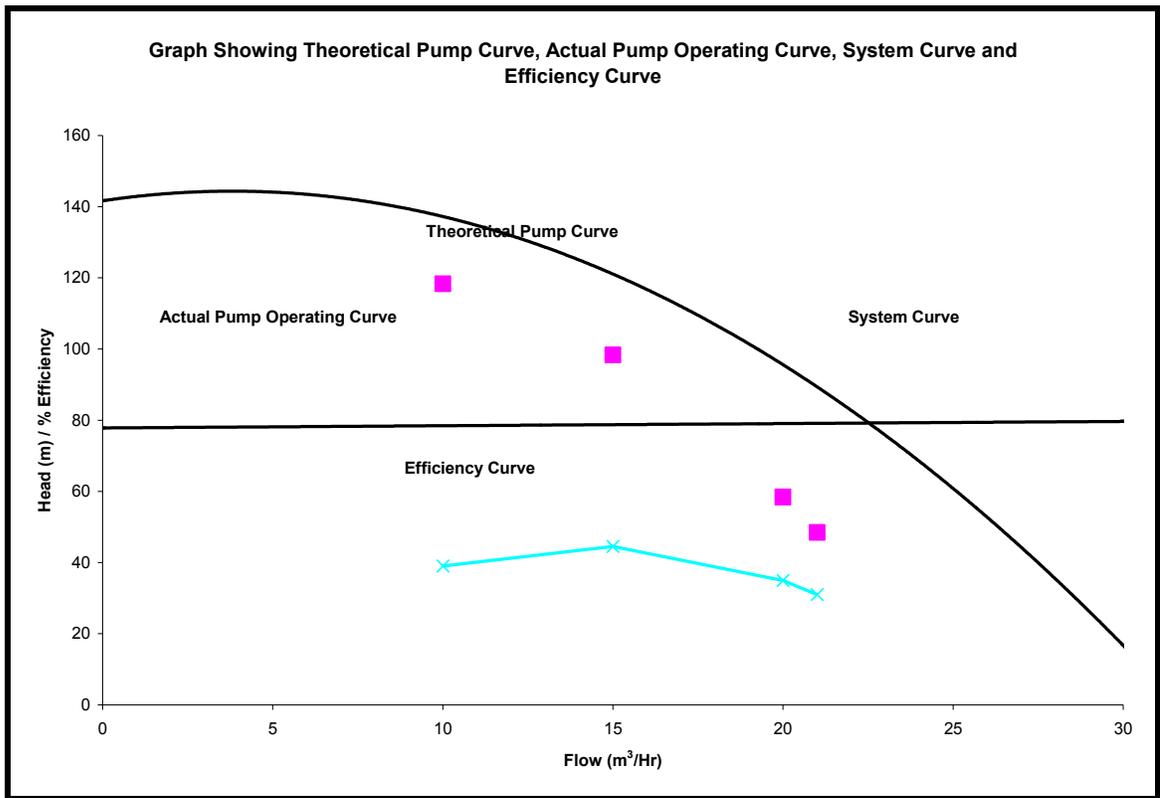
Dynamic Water Level: m

Safe Yield: 27 m³/Hr

Installed Pump Hydraulic Capacity: 20m³/Hr x 90 m x 18.5 kW

Pump Make: Super D

Date Installed: 22-10-04



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. However, the intersection between the system curve and theoretical pump curve is near its safe yield. The efficiency of the pump at its operational point is 30.99%. the installed motor is overrated. The recommended pump at the safe yield, based on a pump efficiency of 70% and available motor rating would be 30 m³/Hr x 80 m x 11 kW.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

2.4 Analysis for sites under M&E South

The following sites have been omitted for the respective reasons:

Site	Reason
Choisy Baie Du Cap BH 776	This site has a bypass in the line just after the head plate where some of the pumped water is returned back into the borehole. This bypass is necessary to keep the dynamic water level constant and avoid the pump being switched off due to low water level.
Trois Boutiques BH	This borehole is not connected on the distribution mains
G Bassin	Private Borehole

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

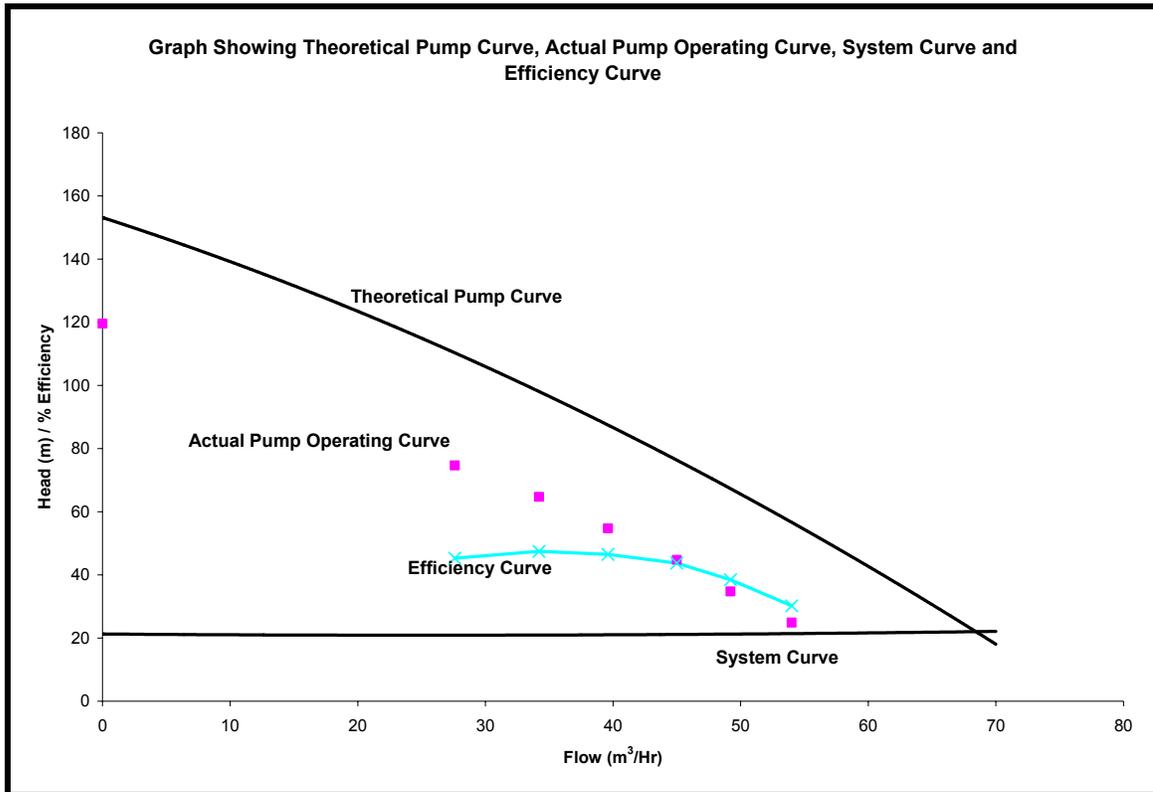
2.41 Analysis for DWS – South system

Café BH 387 (CEB Acc: 5C6275) & T Boutiques BH 204 (CEB Acc:5C3165)

These two boreholes separated by some 1.5 km pump onto Mon Desert Reservoir.

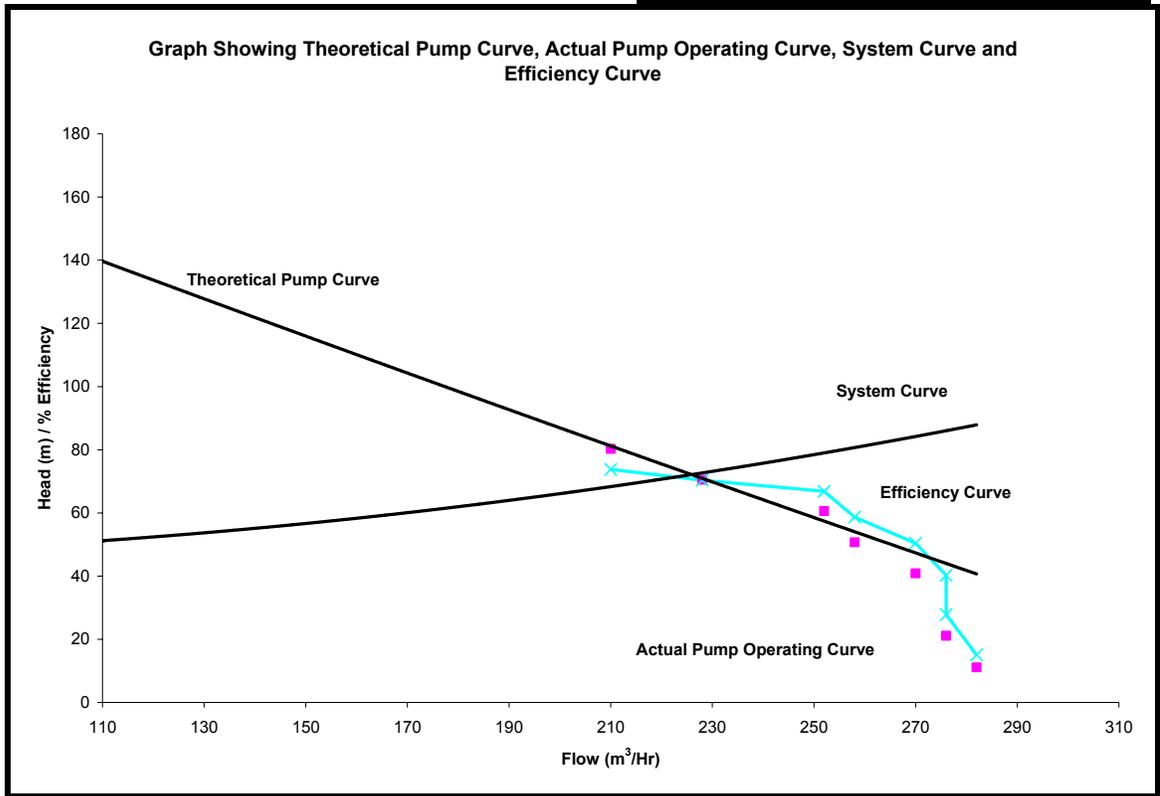
The Borehole characteristics are:

	Café 387	T Boutiques 204
Borehole Depth:	36 m	36.8 m
Dynamic Water Level:	13 m	19.4 m
Safe Yield:	55 m ³ /Hr	250 m ³ /Hr
Installed Pump Hydraulic Capacity:	50 m ³ /Hr x 50 m x 15 kW	220 m ³ /Hr x 75 m x 66 kW
Pump Make:	Grundfos	Caprari
Date Installed	02-07-00	01-07-99



Café 387

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II



T Boutiques 204

Based on tests,

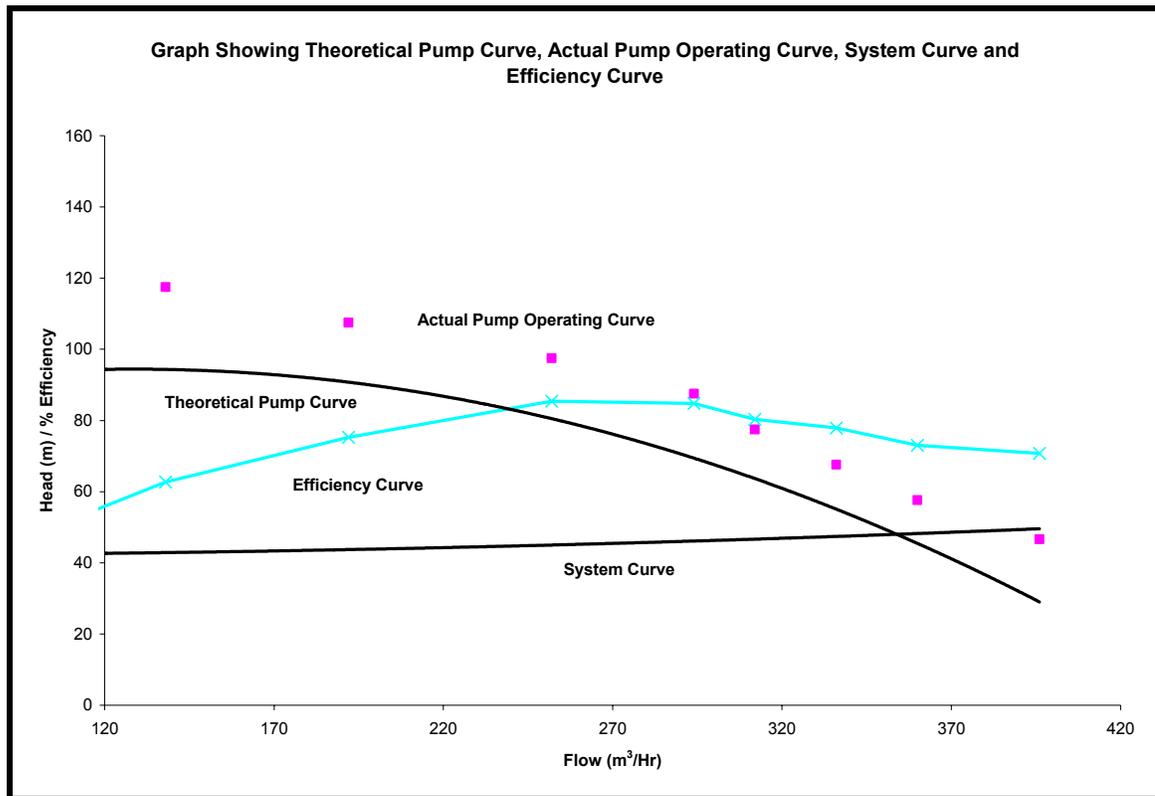
- For Café 387, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above safe yield. The efficiency of the pump at its operational point is 30.2%. However, the delivery head of the pump is overrated so that it is operational on the delivery mains being fed by T Boutique BH. (Calculated Pressure at junction of Café to Trois Boutiques Line: 5 Bar)
- For T Boutiques, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 66%. This pump is rated correctly and performing efficiently.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Cluny 217 A, B & C (CEB Acc:5C3152)

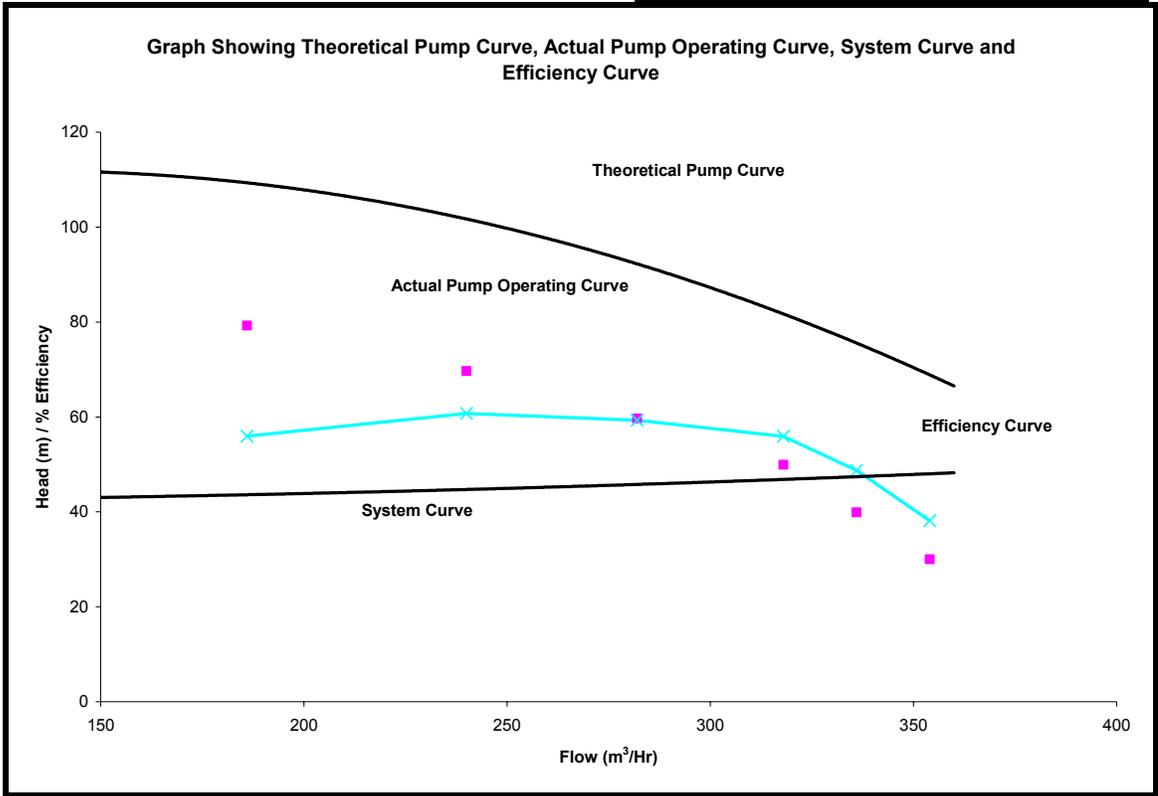
This site has three boreholes. BH 217A and BH 217B operate simultaneously and feed New Cluny reservoir, whereas BH 217C feeds directly on the distribution mains

	217A	217B	217C
Borehole Depth:	42.6 m	45.72 m	45 m
Dynamic Water Level:	11.2 m	11.69 m	6.48 m
Safe Yield:	300 m ³ /Hr	300 m ³ /Hr	300 m ³ /Hr
Installed Pump Hydraulic Capacity:	300 m ³ /Hr x 60 m x 92 kW	275 m ³ /Hr x 75 m x 92 kW	393 m ³ /Hr x 40 m x 75 kW
Pump Make:	Caprari	Caprari	Caprari
Date Installed	08-06-04	27-05-97	01-04-05

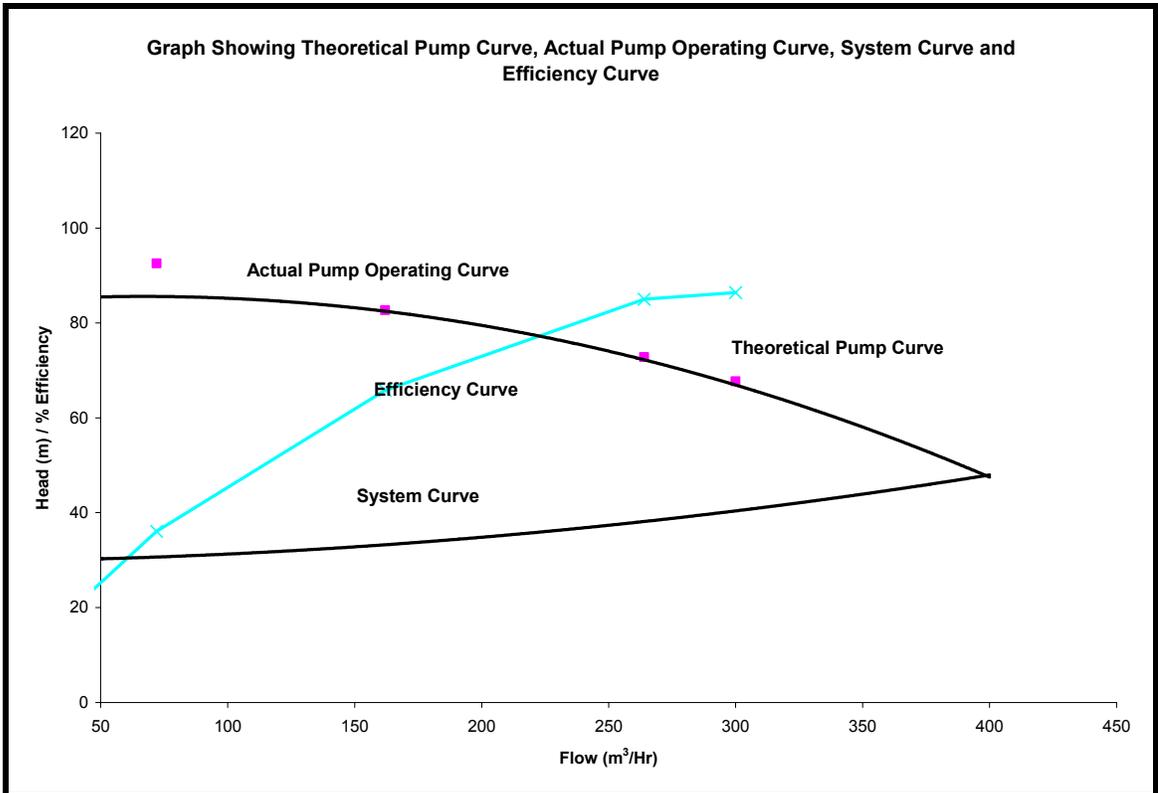


Cluny 217A

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***



Cluny 217B



Cluny 217C

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Based on tests,

- For Cluny 217A, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above safe yield. The efficiency of the pump at its operational point is 70.7%.
- For Cluny 217B, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. There is no intersection between the system curve and theoretical pump curve. The efficiency of the pump at its operational point is 38.7%.
- For both the above sites, it is found that the delivery head of the pumps are overrated. Based on a pump efficiency of 70% and available motor rating would be 300 m³/Hr x 40 m x 52 kW
- For Cluny 217C, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above safe yield. The efficiency of the pump at its operational point is 86.4%. The electrical motor of this pump is overrated. The recommended pump at the safe yield, based on a pump efficiency of 70% and available motor rating would be 300 m³/Hr x 40 m x 52 kW.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Gebert BH 667 (CEB Acc: 5C5964)

The Borehole characteristics are:

Borehole Depth: 82 m

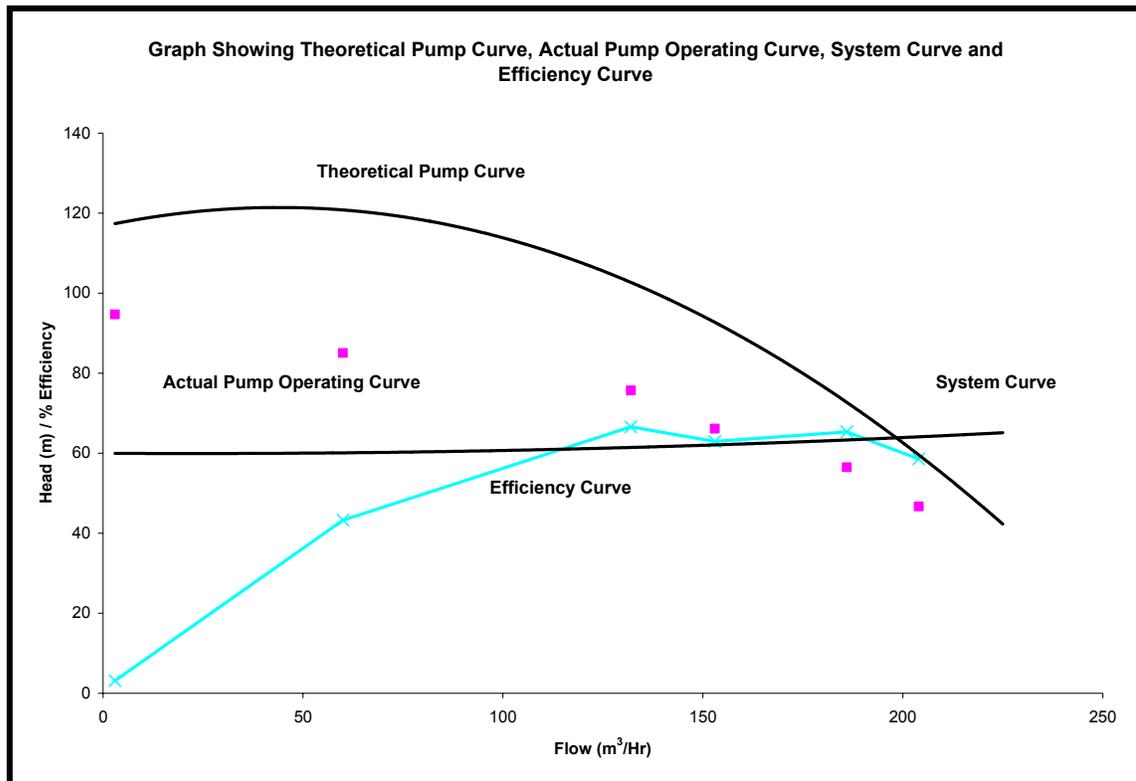
Dynamic Water Level: 45 m

Maximum Borehole Production: 245m³/Hr

Installed Pump Hydraulic Capacity: 150 m³/Hr x 80 m x 45 kW

Pump Make: Caprari

Date Installed: 24-03-99



The theoretical pump curve of this pump was not available, the suggested alternative pump curve by the supplier shows that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. However, the intersection between the system curve and the actual pump operating curve is within the range of the safe yield. The efficiency of the pump at its operational point is 58.6%. Based on a pump efficiency of 70% and available motor rating a pump of rating 150 m³/Hr x 60 m x 37 kW is recommended

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Nouvelle France BH 725 (CEB Acc:5C6940)

The Borehole characteristics are:

Borehole Depth: 76.74 m

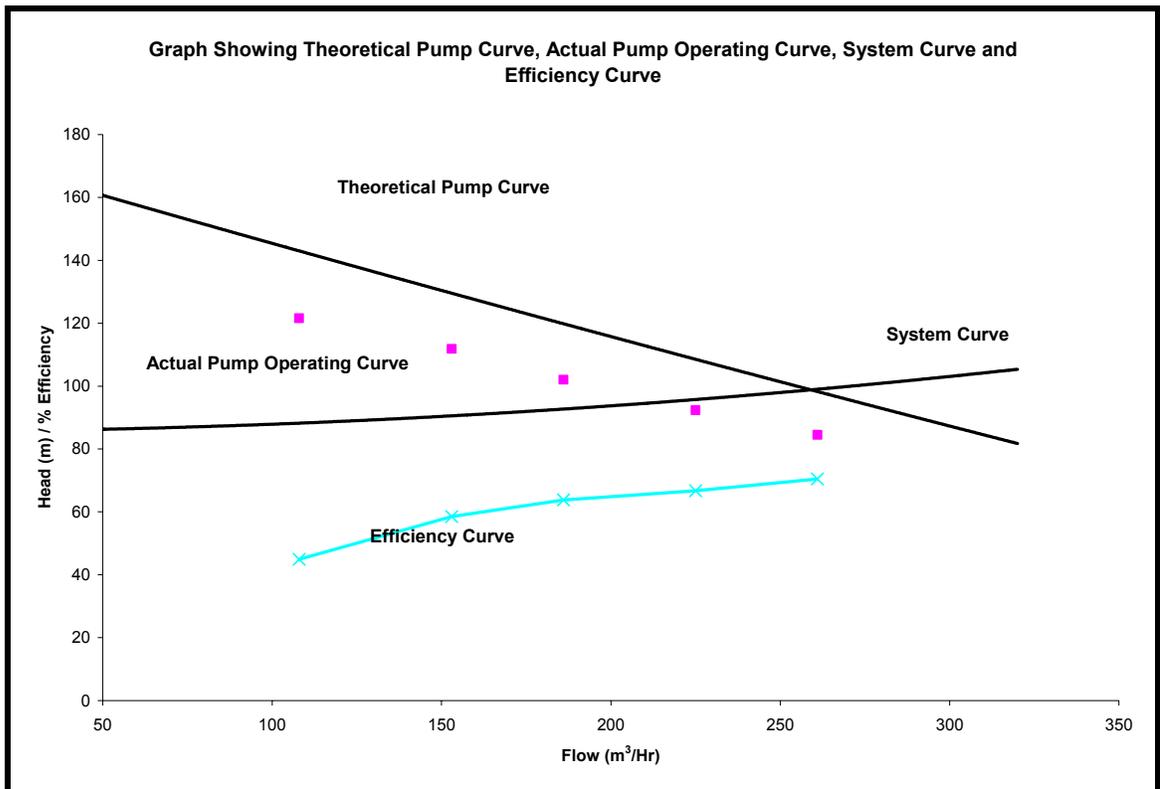
Dynamic Water Level: 54 m

Safe Yield: 267 m³/Hr

Installed Pump Hydraulic Capacity: 252 m³/Hr x 100 m x 92 kW

Pump Make: Caprari

Date Installed: 19-11-01



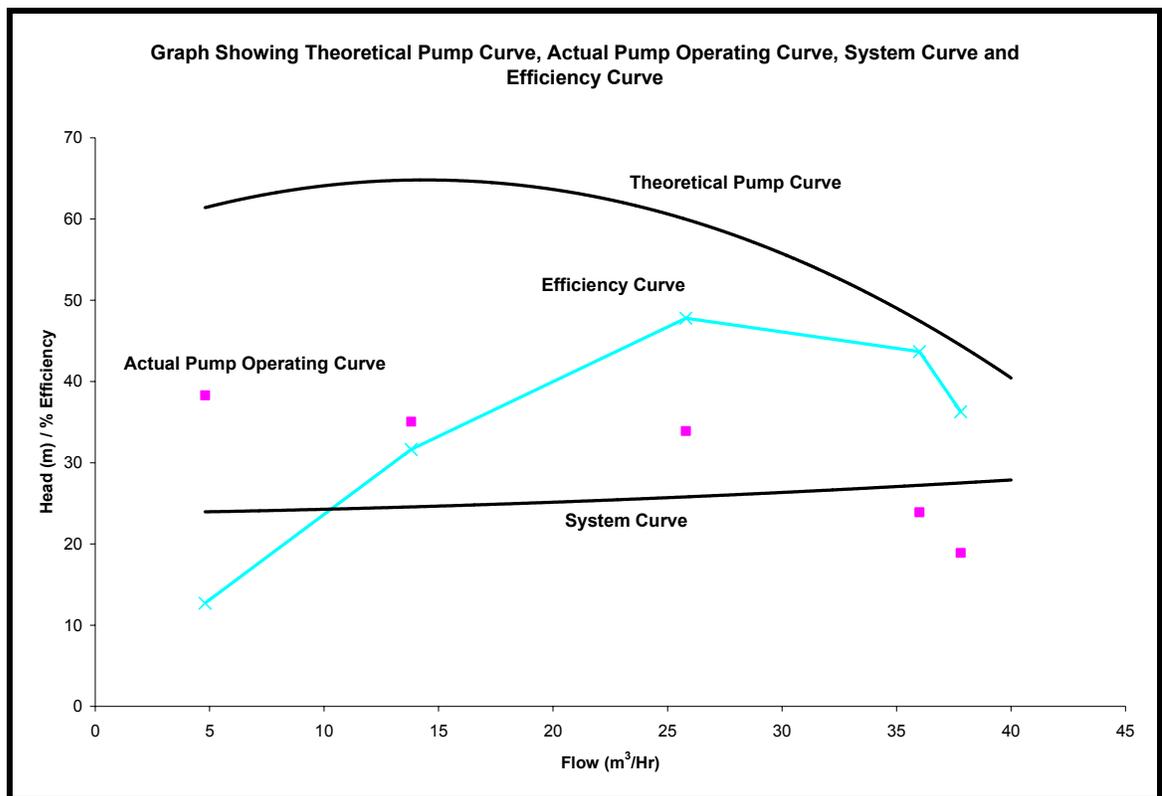
Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 70.4%. This pump is correctly rated and performing efficiently.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Mon Desert Mon Tresor - Plaisance BH 548 A & B (CEB Acc: 5C6067)

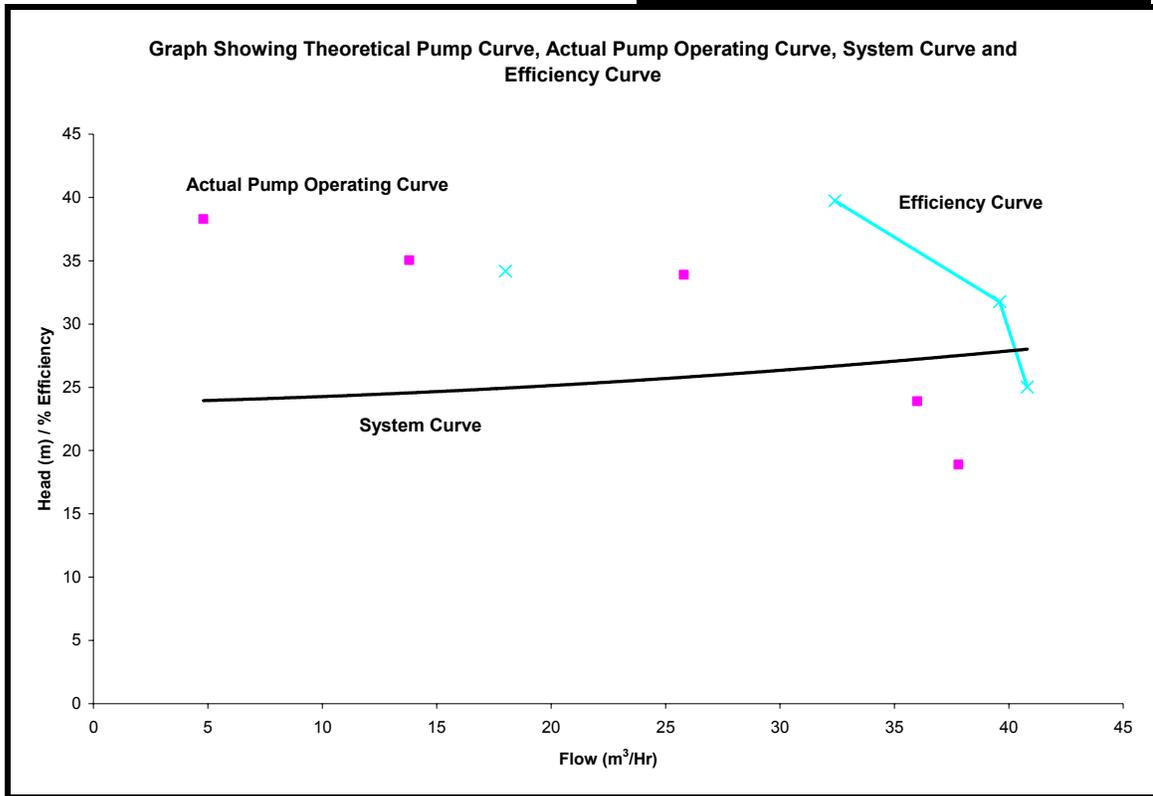
This site has two boreholes which are being operated simultaneously:

	BH 548A	BH548B
Borehole Depth:	30.48 m	30.13 m
Dynamic Water Level:	19 m	20 m
Safe Yield:	30 m ³ /Hr	30 m ³ /Hr
Installed Pump Hydraulic Capacity:	30 m ³ /Hr x 50 m x 7.5 kW	45 m ³ /Hr x 40 m x 7.5 kW
Pump Make:	Caprari	Rovatti
Date Installed:	25-04-00	14-03-02



MDMT 548A

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***



MDMT 548B

Based on tests,

- For MDMT548A, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. There is no intersection between the system curve and theoretical pump curve. The efficiency of the pump at its operational point is 31.6%.
- For MDMT 548B, the theoretical pump curve is not available. The efficiency of the pump at its operational point is 25%.
- For both the above sites, it is found that the delivery head of the pumps are overrated. Based on a pump efficiency of 70% and available motor rating the required pump would be 30 m³/Hr x 30 m x 5.5 kW

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

2.42 Analysis for MAV - Upper system

Alma BH 316A (CEB Acc: 3C7476)

The Borehole characteristics are:

Borehole Depth: 40 m

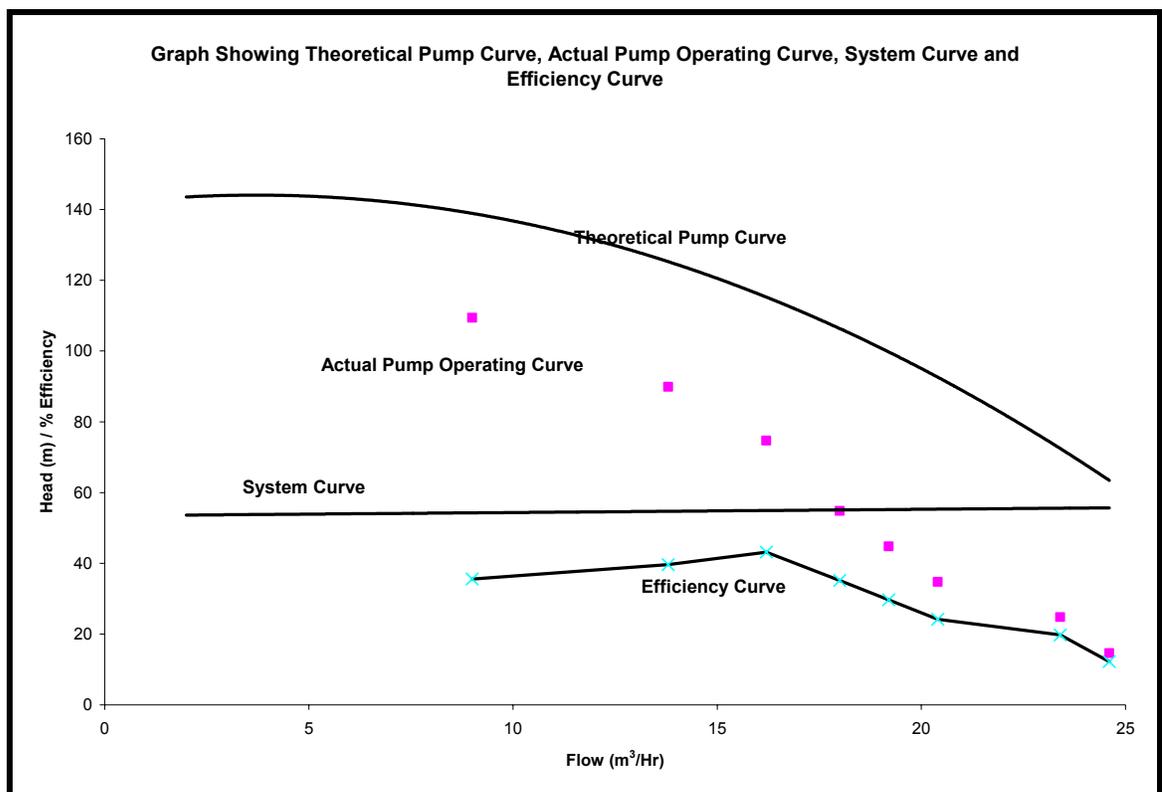
Dynamic Water Level: 32 m

Safe Yield: 25 m³/Hr

Installed Pump Hydraulic Capacity: 20 m³/Hr x 90 m x 7.5 kW

Pump Make: Super D

Date Installed: 14-04-97



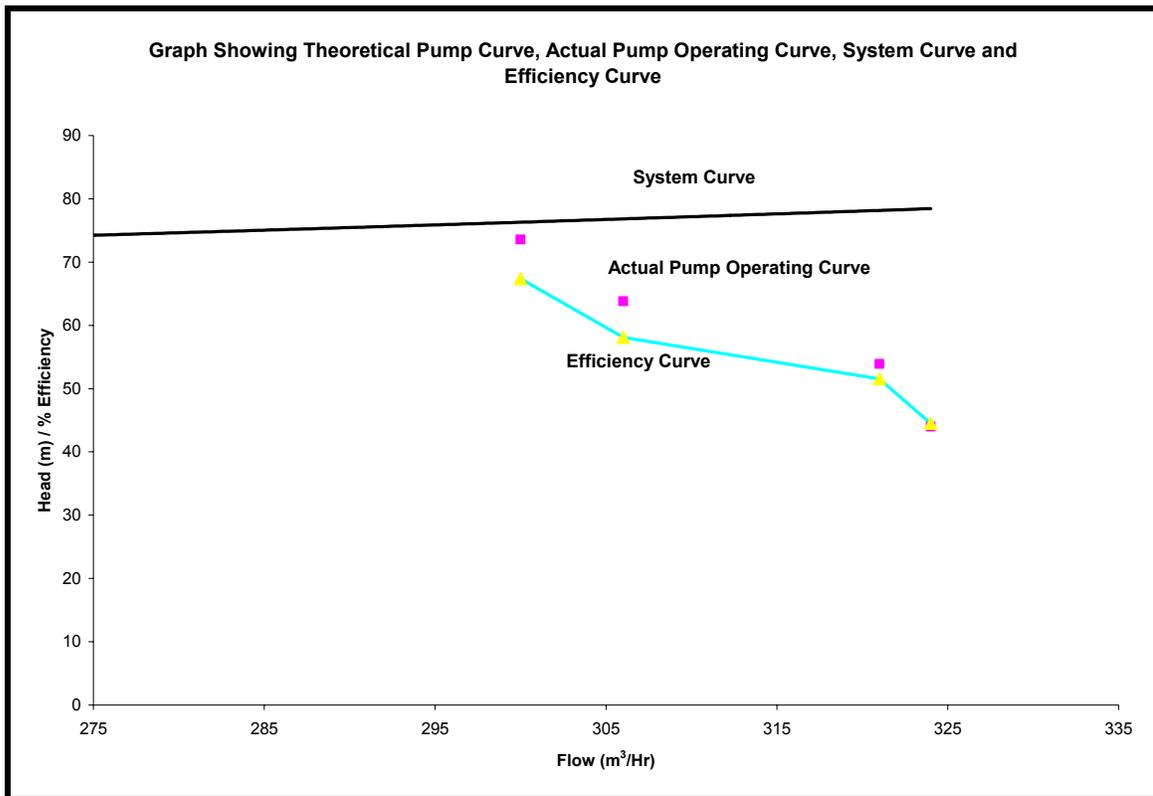
Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above the safe yield. The efficiency of the pump at its operational point is 39.6%. Based on a pump efficiency of 70% and available motor rating a pump of rating 25 m³/Hr x 60 m x 5.5 kW is recommended

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Beard BH 715 & 828 (CEB Acc:4C6761)

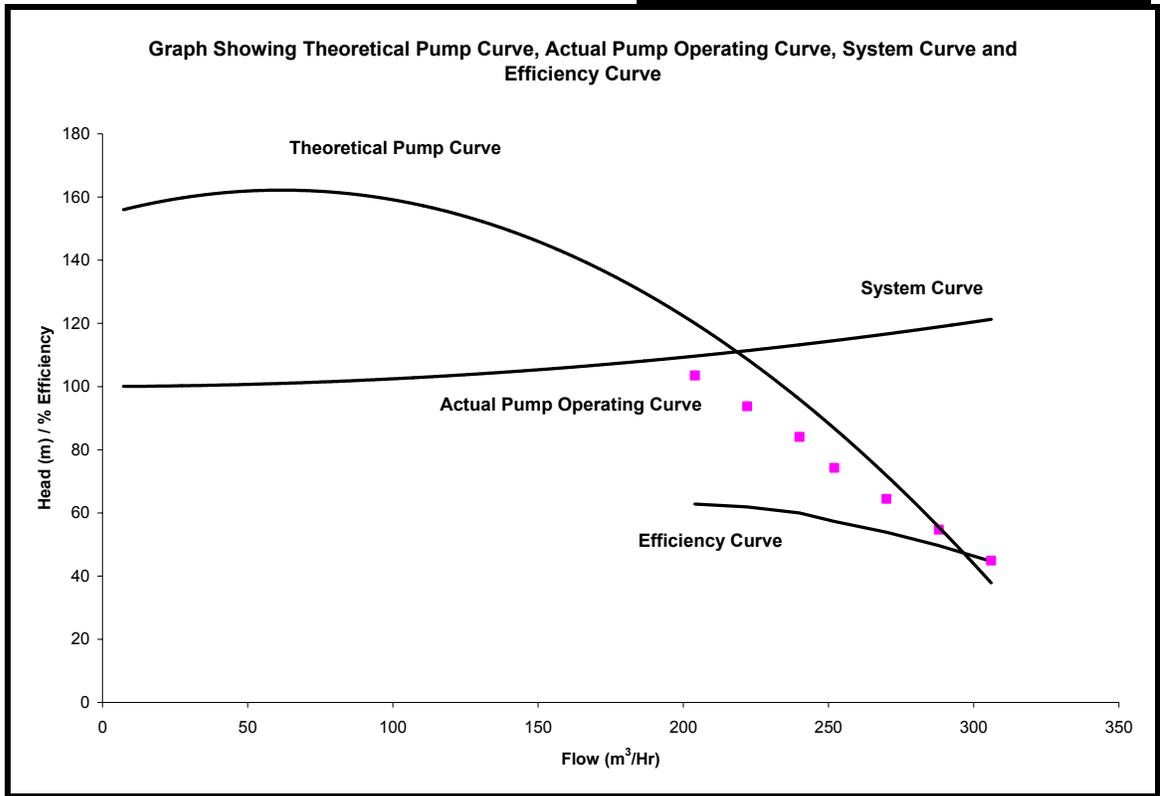
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 715	BH828
Borehole Depth:	60m	117 m
Dynamic Water Level:	43.1m	83.59 m
Safe Yield:	250m ³ /Hr	209 m ³ /Hr
Installed Pump Hydraulic Capacity:	250m ³ /Hr x 85m x 92 kW	210 m ³ /Hr x 110 m x 92 kW
Pump Make:	KSB	Caprari
Installed Date:	10-06-05	19-11-01



Beard 715

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**



Beard 828

Based on tests,

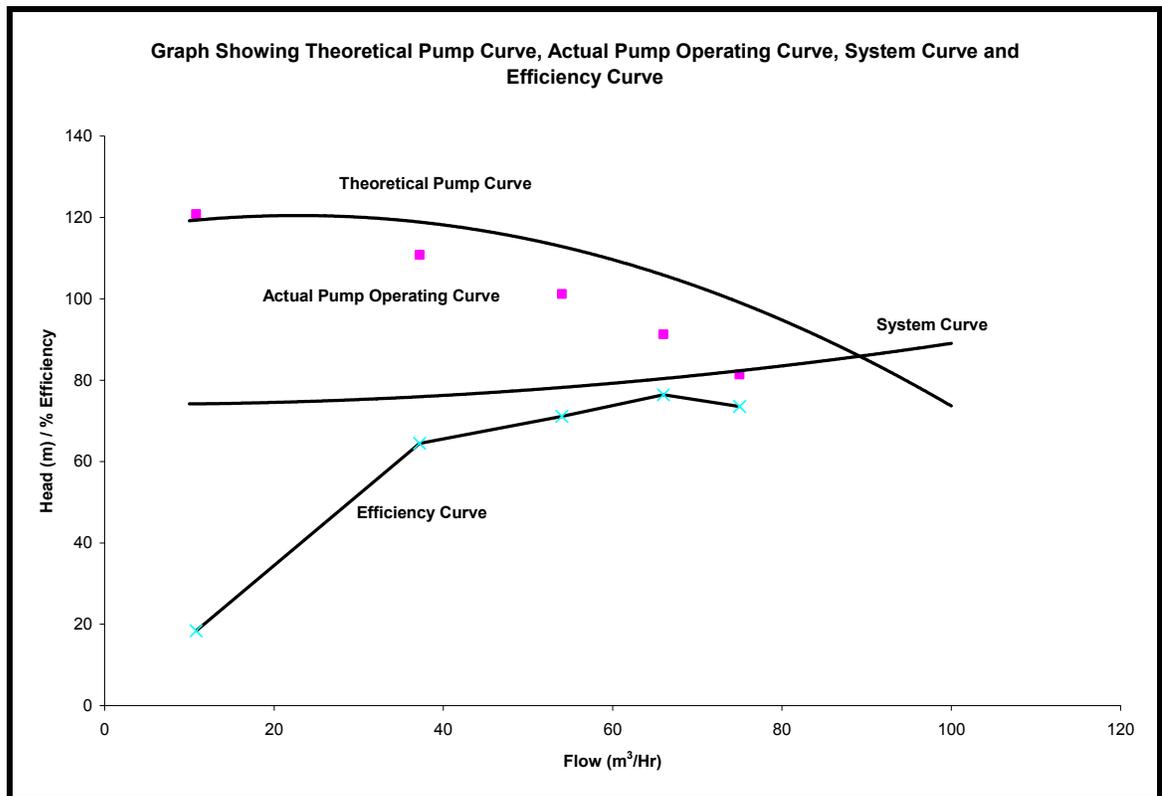
- For Beard 715, the theoretical pump curve is not available. This site has been continuously producing above 250 m³/Hr without any drop in water level. The efficiency of the pump at its operational point is 58.6%.
- For Beard 828 it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. Moreover, the intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 44.7%. This borehole has been continuously producing above 209 m³/Hr without any drastic drop in water level.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Bonne Veine BH 623 & 619 (CEB Acc:5C6275)

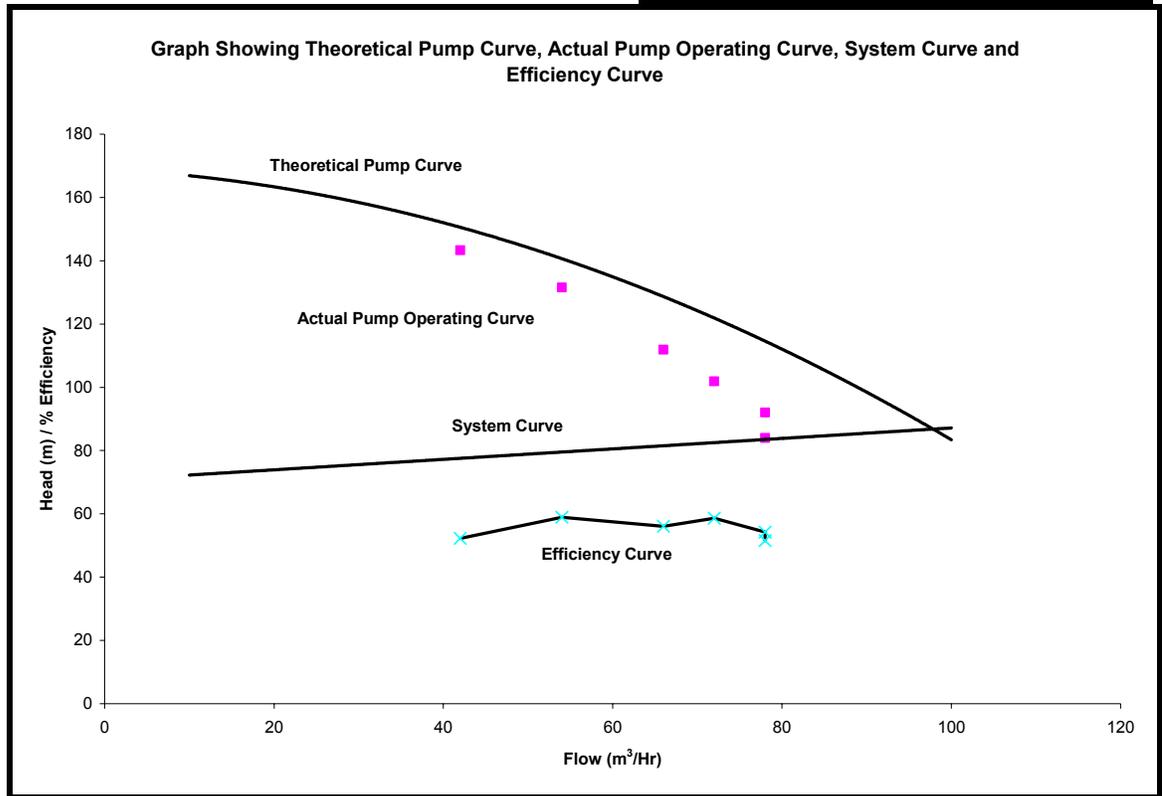
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 623	BH 619
Borehole Depth:	50.6 m	52 m
Dynamic Water Level:	9.35 m	7.71 m
Safe Yield:	96 m ³ /Hr	114 m ³ /Hr
Installed Pump Hydraulic Capacity:	70 m ³ /Hr x 100 m x 30 kW	90 m ³ /Hr x 100 m x 37 kW
Pump Make:	Caprari	Saer
Date Installed	10-01-02	13-10-05



B Veine 623

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***



B Veine 619

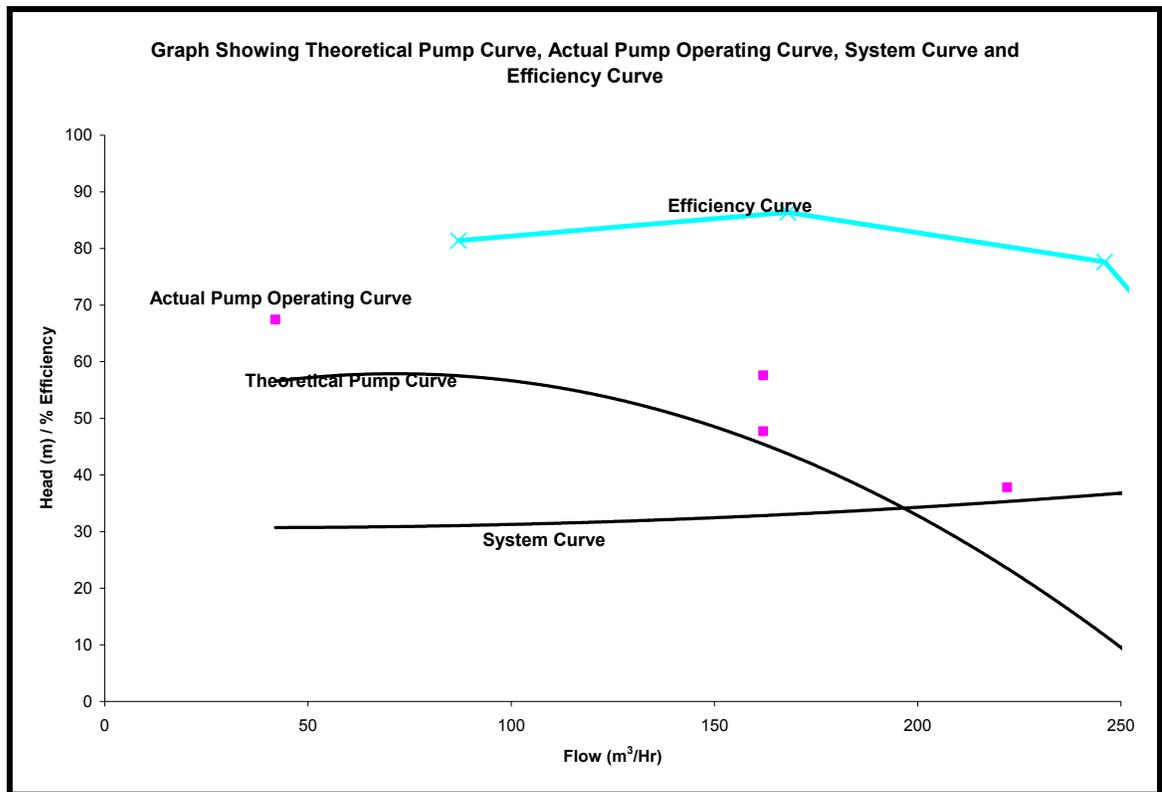
- For Bonne Veine 623, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. Moreover, the intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 73.5%.
- For Bonne Veine 619, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. Moreover, the intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 54.5%.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Montee Du Fil BH 488A & 488C (CEB Acc:4C3082)

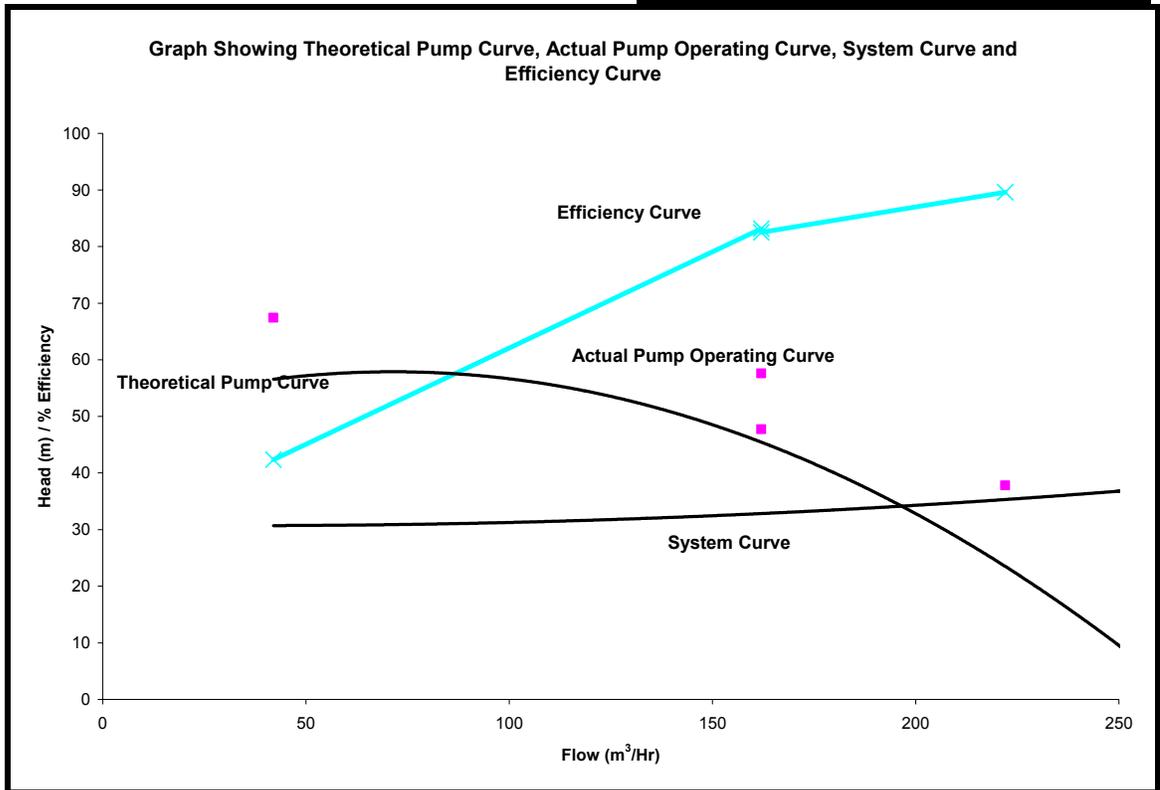
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 488A	BH 488C
Borehole Depth:	48.1 m	42 m
Dynamic Water Level:	23.5 m	24.4 m
Safe Yield:	348 m ³ /Hr	348 m ³ /Hr
Installed Pump Hydraulic Capacity:	394 m ³ /Hr x 38.5 m x 85 kW	175 m ³ /Hr x 40 m x 26 kW
Pump Make:	British Pleuger	Caprari
Date Installed	Year 88	21-07-00



Montee Du Fil 488A

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***



Montee Du Fil 488C

- For Montee Du Fil 488A, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. Moreover, the intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 52.9%.
- For Montee Du Fil 488C, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. Moreover, the intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 88%.

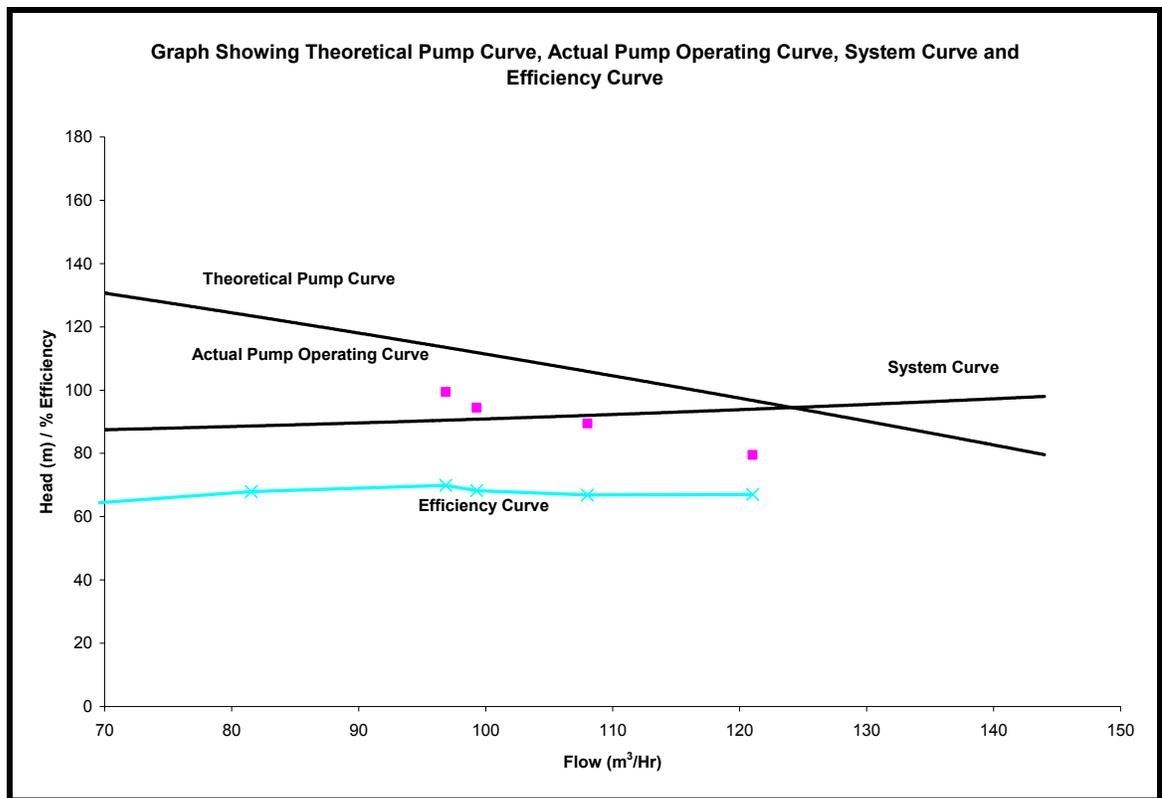
Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

2.43 Analysis for MAV – Lower system

Bambou Eau Bonne BH 247A (CEB Acc:3C4041)

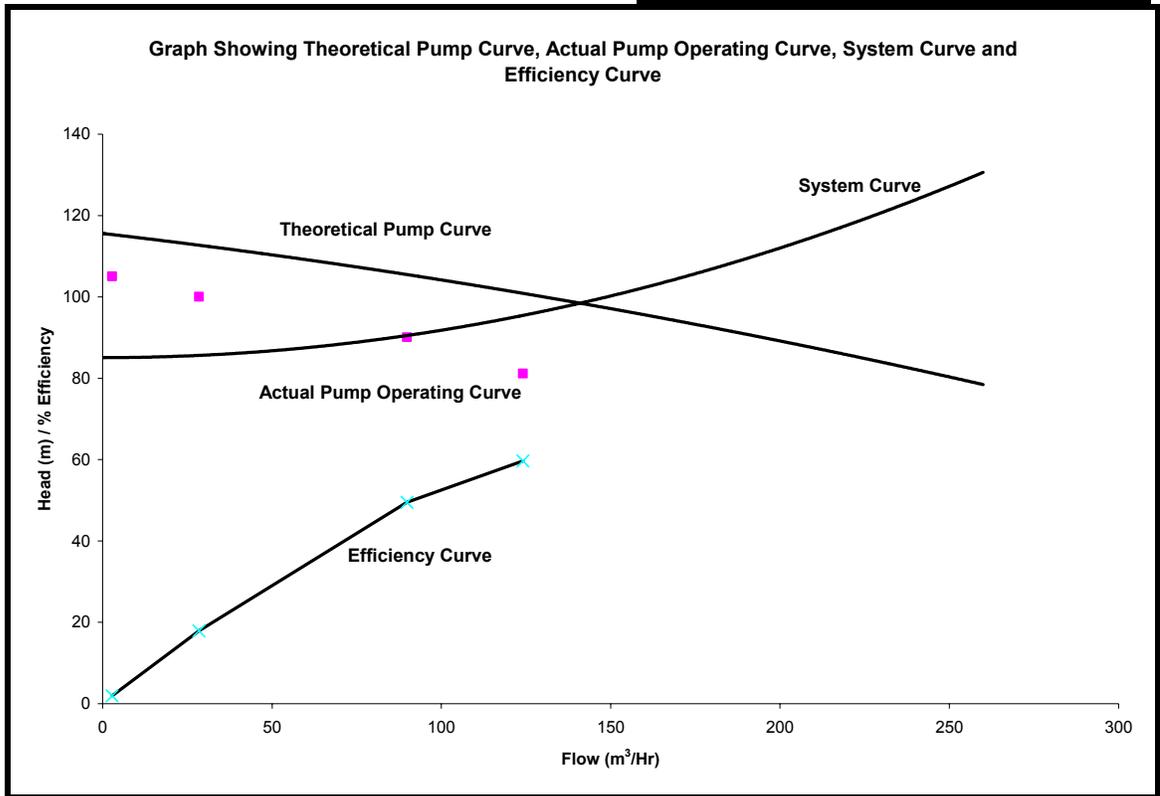
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 247A	BH247B
Borehole Depth:	23.8 m	26.3 m
Dynamic Water Level:	12 m	13 m
Safe Yield:	120 m ³ /Hr	160 m ³ /Hr
Installed Pump Hydraulic Capacity:	125 m ³ /Hr x 100 m x 55 kW	275 m ³ /Hr x 75 m x 75 kW
Pump Make:	Rovatti	Caprari
Date Installed	24-04-03	03-09-02



247-A

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***



247-B

Based on tests,

- For Eau Bonne 247-A, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 68.2%.
- For Eau Bonne 247-B, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 59.7%. This pump is however overrated and the recommended pump, based on a pump efficiency of 70% and available motor rating is 160 m³/Hr x 90 m x 56 kW

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Barkly (Herchenroeder) BH 664 (CEB Acc: 3C5878)

The Borehole characteristics are:

Borehole Depth: 72 m

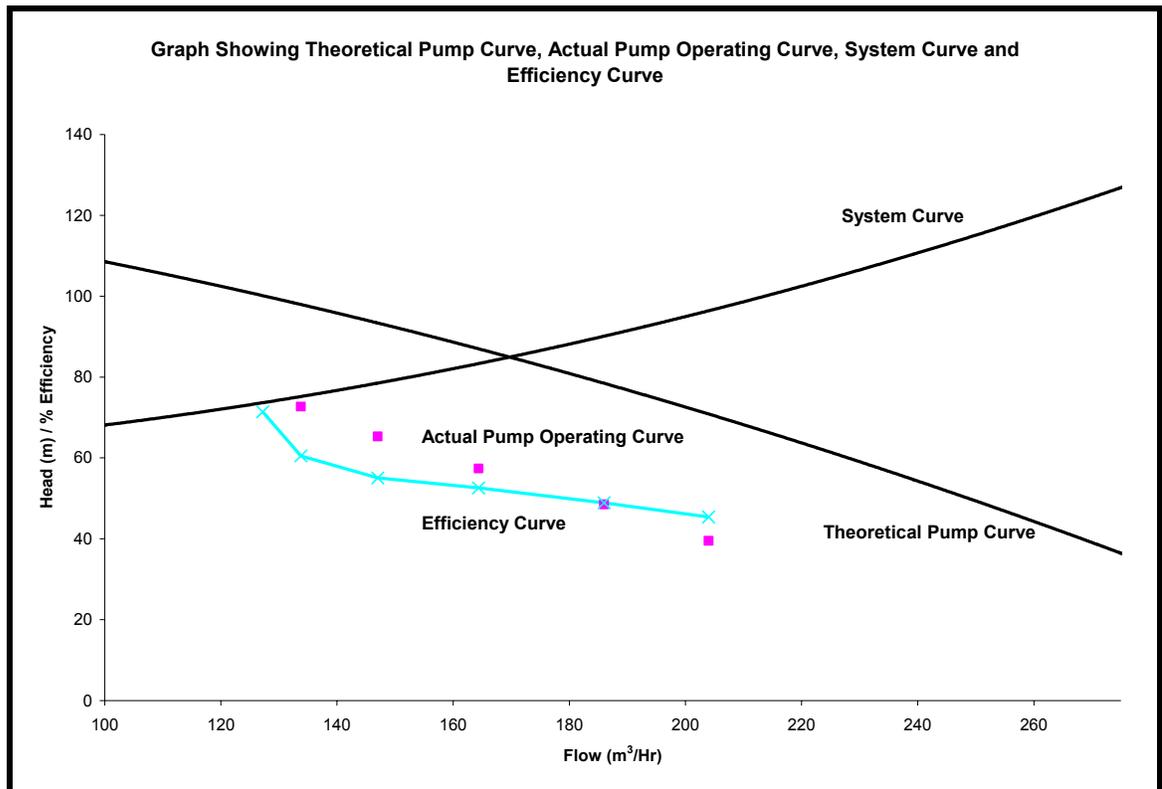
Dynamic Water Level: 49 m

Safe Yield: 250 m³/Hr

Installed Pump Hydraulic Capacity: 180 m³/Hr x 80 m x 51 kW

Pump Make: Caprari

Date Installed: 04-11-04



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The theoretical yield of 250m³/Hr is rarely achieved. The production has been around 180m³/Hr. The intersection between the system curve and theoretical pump curve is near the yield of 180m³/Hr. The efficiency of the pump at its operational point is 45.4%. Based on a pump efficiency of 70% and available motor rating a pump of rating 180 m³/Hr x 80 m x 42 kW is recommended.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Barkly Swimming Pool BH 501 (CEB Acc:3C3223)

The Borehole characteristics are:

Borehole Depth: 44 m

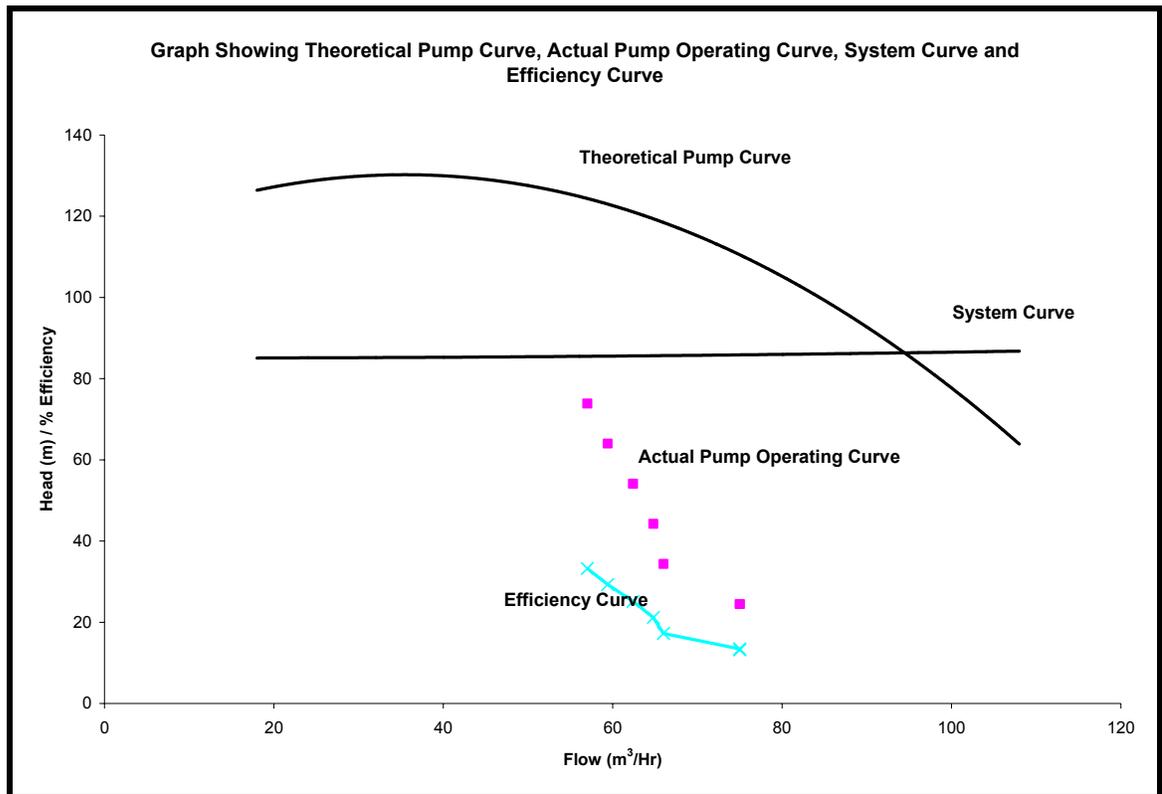
Dynamic Water Level: 32.88 m

Safe Yield: 90 m³/Hr

Installed Pump Hydraulic Capacity: 90 m³/Hr x 100 m x 37 kW

Pump Make: Caprari

Date Installed: 14-05-05



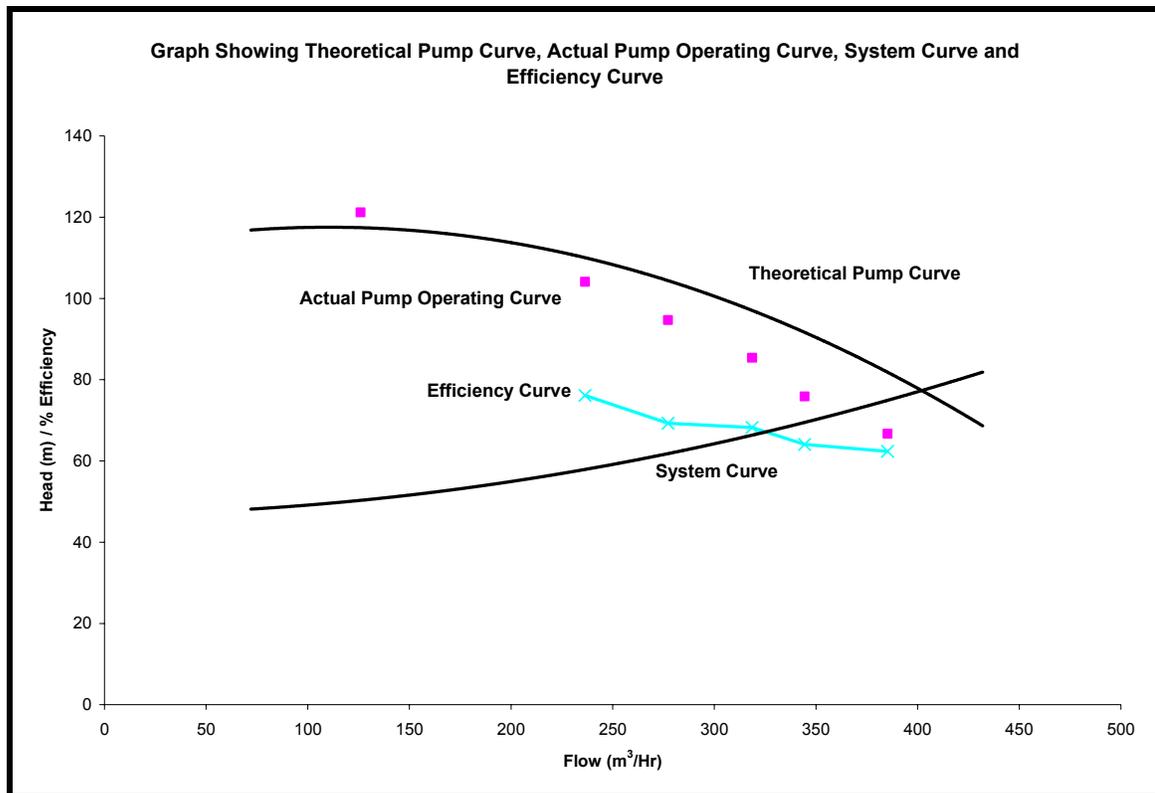
Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating on its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 13.2%. Based on a pump efficiency of 70% and available motor rating a pump of rating 90 m³/Hr x 90 m x 32 kW is recommended.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Bassin BH 432 A & B (CEB Acc:7C3894), 717(CEB Acc:7C3798)

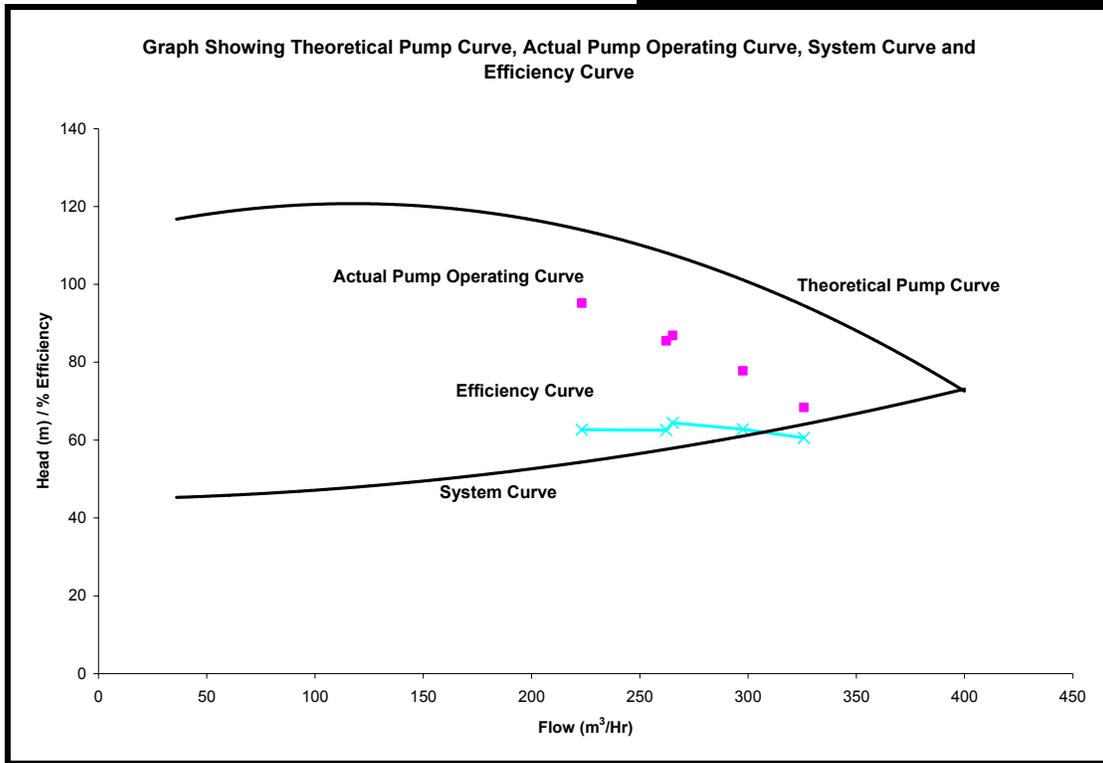
This site has four boreholes which are used in parallel. The Borehole characteristics are:

	BH 432A	BH432B	BH 717
Borehole Depth:	53.6 m	54.1 m	143m
Dynamic Water Level:	33.3 m	31.29 m	61.62 m
Safe Yield:	330 m ³ /Hr	330 m ³ /Hr	191 m ³ /Hr
Installed Pump Hydraulic Capacity:	393 m ³ /Hr x 74 m x 110 kW	350 m ³ /Hr x 72 m x 110 kW	300 m ³ /Hr x 100 m x 92 kW
Pump Make:	Caprari	Caprari	Caprari
Date Installed:	28-10-05	22-09-06	4-10-05

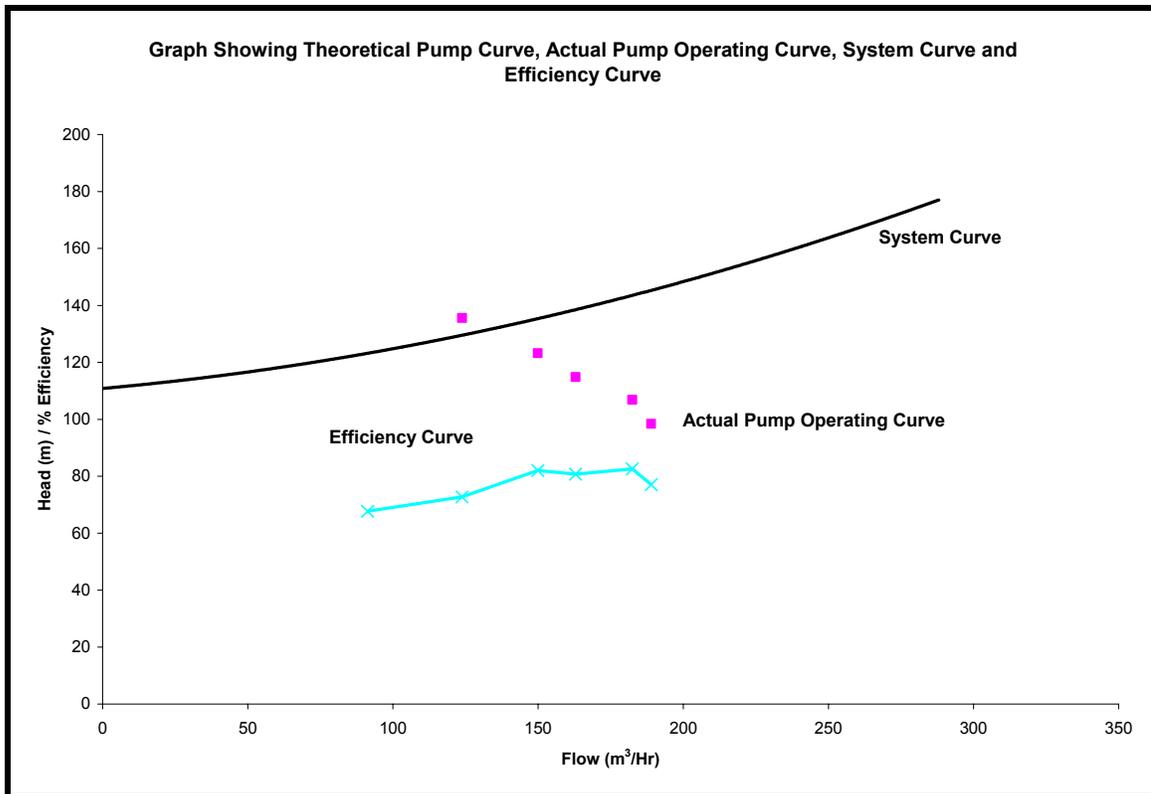


Bassin 432A

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***



Bassin 432B



Bassin 717

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Based on tests,

- For Bassin 432A, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 64%.
- For Bassin 432B, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 62.5%. This pump has been overrated to compensate the head required to operate in parallel with Bassin 432A, Bassin 435 and Bassin 717.
- For Bassin 717, the theoretical pump curve is not available. The efficiency of the pump at its operational point is 77%.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Chamarel BH 796 (CEB Acc:7090003261(5))

The Borehole characteristics are:

Borehole Depth: 87 m

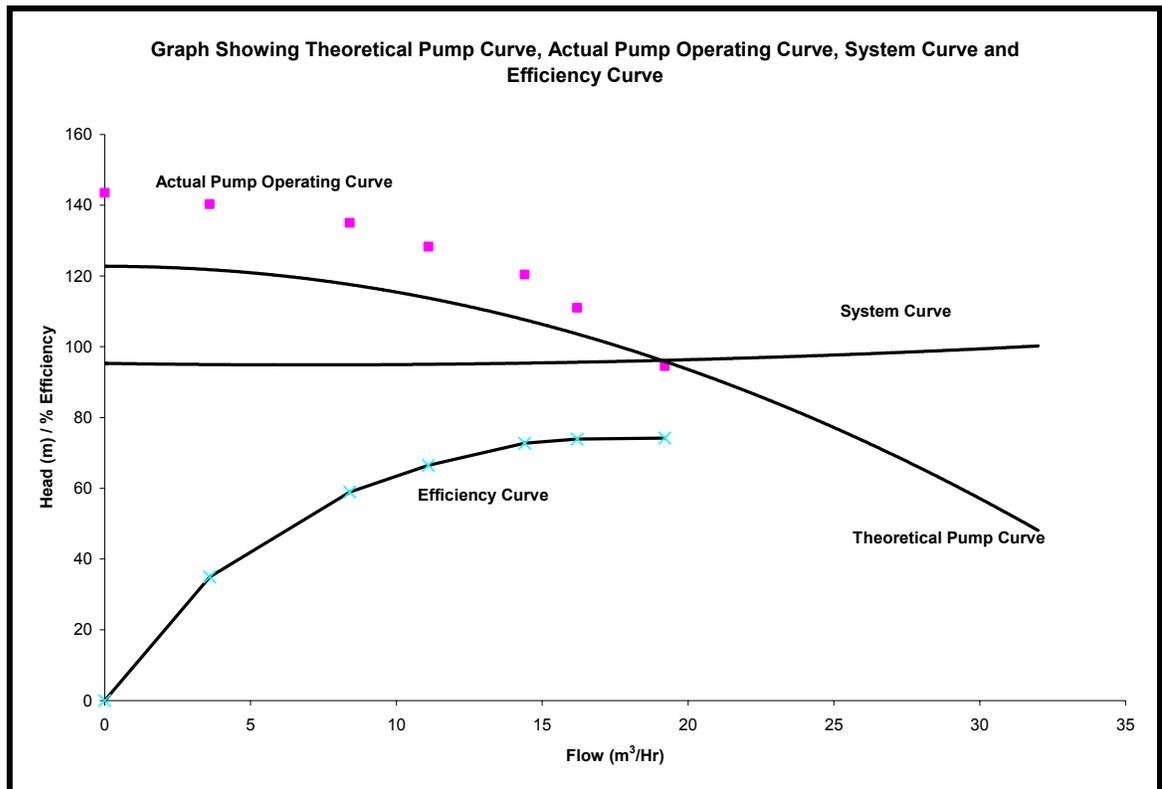
Dynamic Water Level: 46 m

Safe Yield: 18.7 m³/Hr

Installed Pump Hydraulic Capacity: 21 m³/Hr x 87 m x 7.5 kW

Pump Make: Caprari

Date Installed: 23-01-06



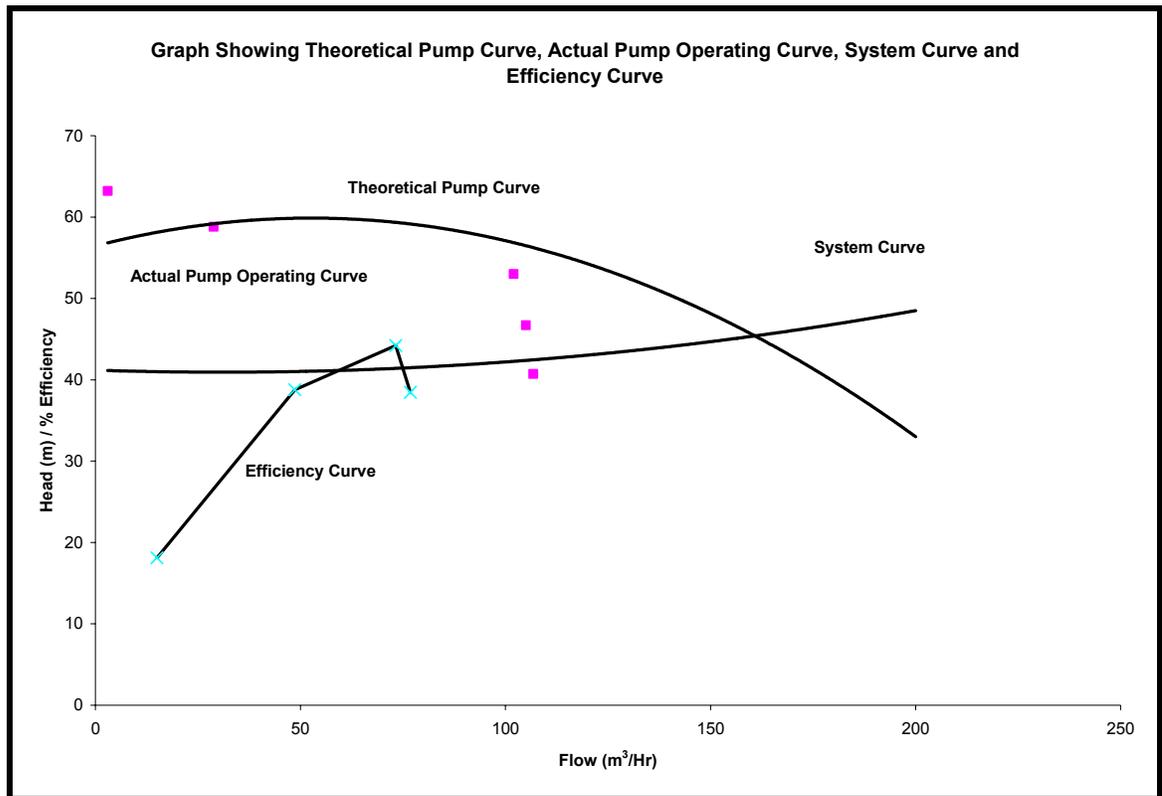
Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 74.2%.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Clairfonds BH 176A & 176C (CEB Acc:4C1520)

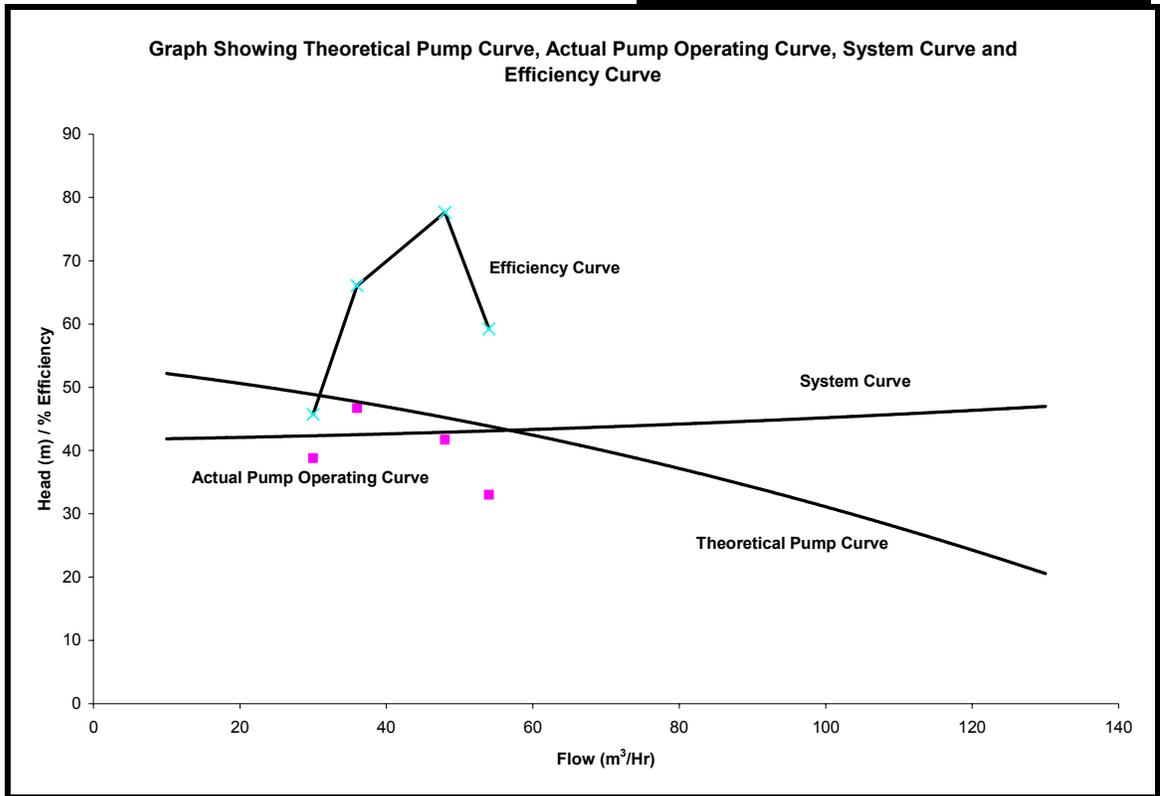
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 176A	BH176C
Borehole Depth:	48.7 m	45.7 m
Dynamic Water Level:	30.7 m	36.9 m
Safe Yield:	90 m ³ /Hr	90 m ³ /Hr
Installed Pump Hydraulic Capacity:	180 m ³ /Hr x 40 m x 26 kW	90 m ³ /Hr x 30 m x 11 kW
Pump Make:	Caprari	Caprari
Date Installed	20-07-05	04-08-05



Clairfonds 176A

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II



Clairfonds 176C

Based on tests,

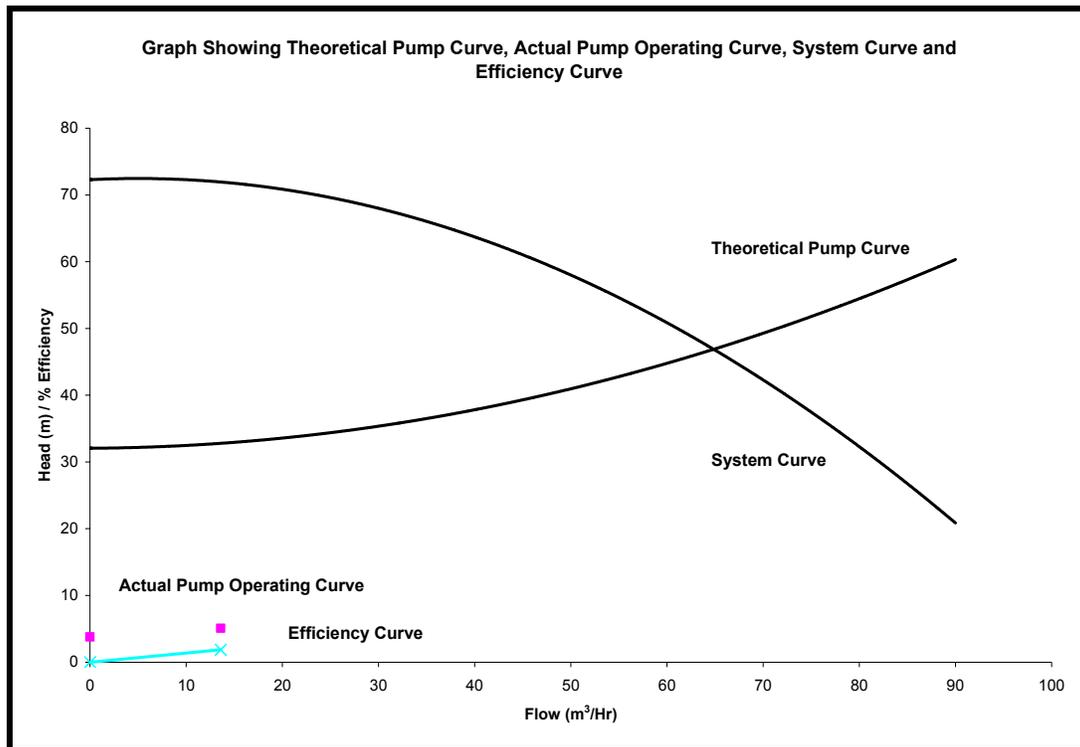
- For Clairfonds 176A, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 38.4%. This pump is overrated and the recommended pump, based on a pump efficiency of 70% and available motor rating is 90 m³/Hr x 50 m x 22 kW
- For Clairfonds 176C, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 59.2%.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Ebene BH 477 & 659 (CEB Acc: 7C4864)

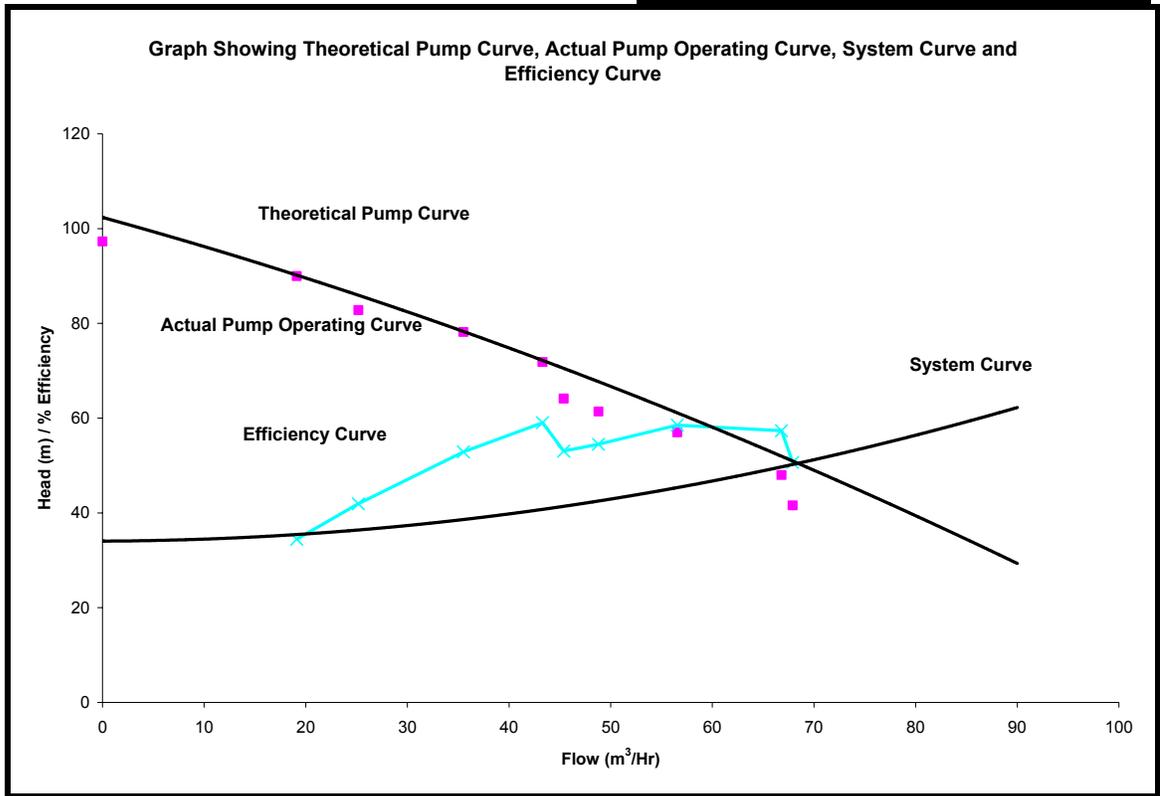
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 477	BH659
Borehole Depth:	48.7 m	51.5m
Dynamic Water Level:	38 m	40 m
Safe Yield:	60 m ³ /Hr	60m ³ /Hr
Installed Pump Hydraulic Capacity:	55m ³ /Hr x 45 m x 11 kW	60m ³ /Hr x 46 m x 13 kW
Pump Make:	Caprari	Caprari
Date Installed	19-12-98	19-12-96



Ebene 477

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***



Ebene 659

Based on tests,

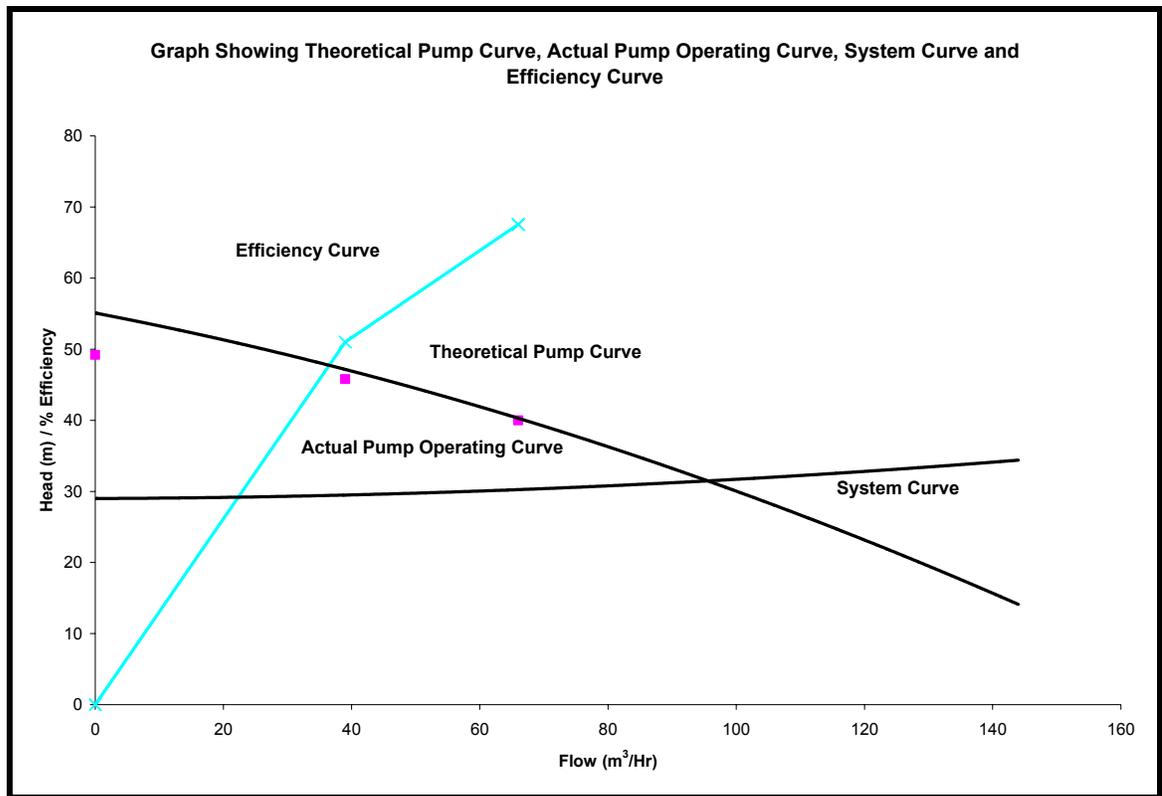
- For Ebene 477, it is found that the Installed Pump Hydraulic Capacity was not performing at all. It has been replaced by a new pump of make Saer and rated at 55 m³/Hr x 70 m x 13 kW. The delivery head of this newly Installed Pump Hydraulic Capacity is overrated. The required pump for this borehole is 60 m³/Hr x 40 m x 11kW.
- For Ebene 659, it is found that the pump is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 50.7%.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Highlands BH 392 A & B (CEB Acc: 7C3694)

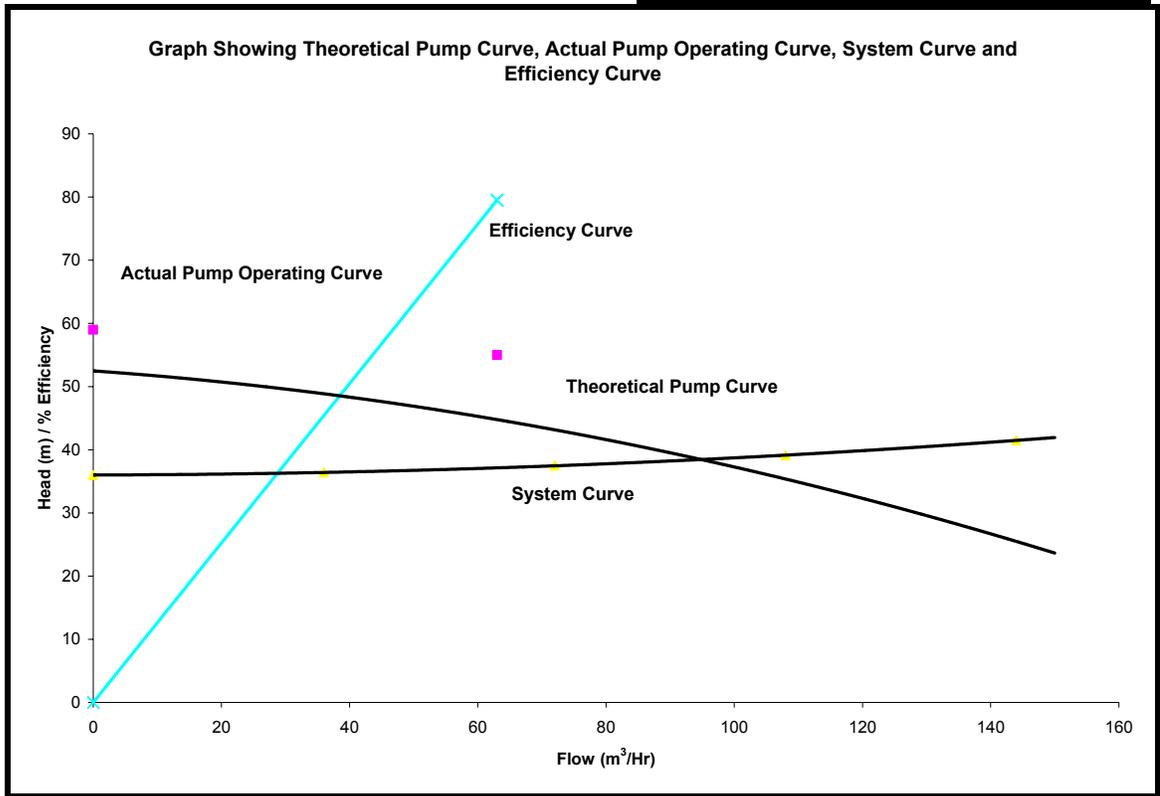
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 392A	BH3 92B
Borehole Depth:	36.12 m	38.1 m
Dynamic Water Level:	22.2 m	32.6 m
Safe Yield:	92 m ³ /Hr	92 m ³ /Hr
Installed Pump Hydraulic Capacity:	100 m ³ /Hr x 30 m x 11 kW	90 m ³ /Hr x 40 m x 15 kW
Pump Make:	Caprari	Caprari
Date Installed:	02-11-00	19-11-03



Highlands 392A

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***



Highlands 392B

Based on tests,

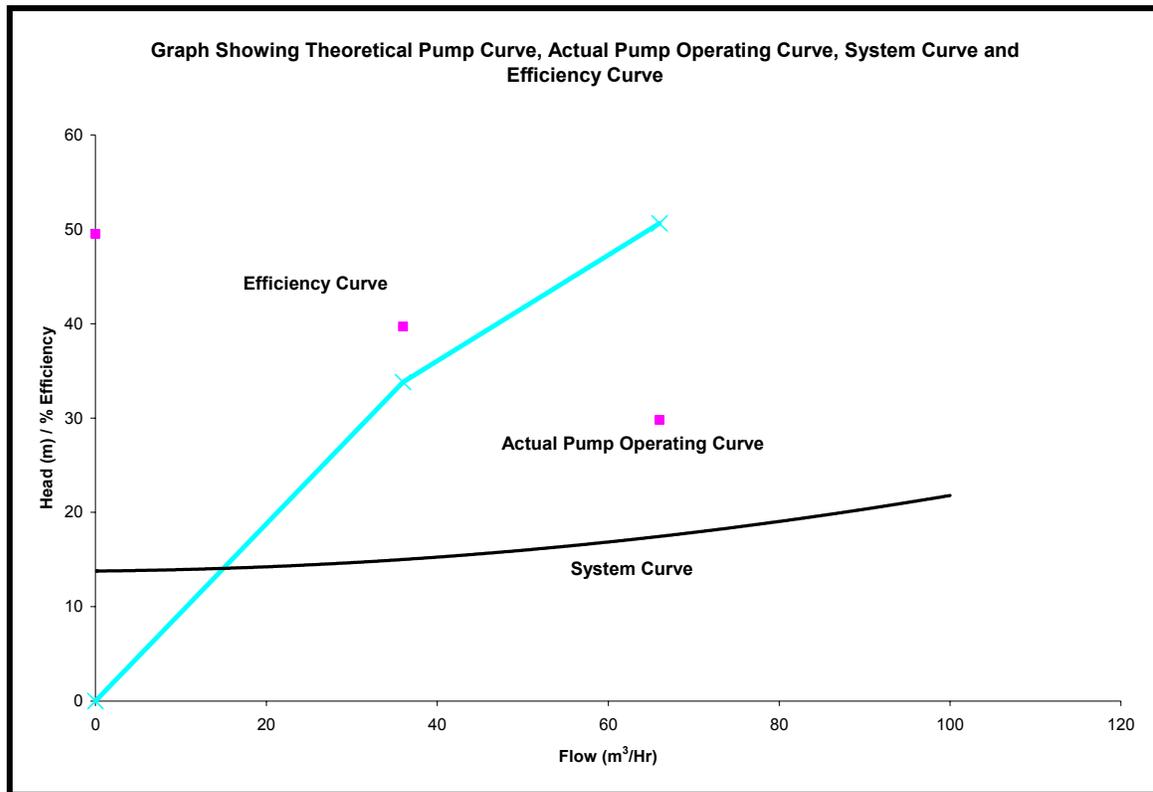
- It is found that the pump installed on Highlands 392A is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 67.6%.
- The pump for Highlands 392B is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 79.5%.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Holyrood BH 35 A, B, D, E & 947(CEB Acc: 7C1530)

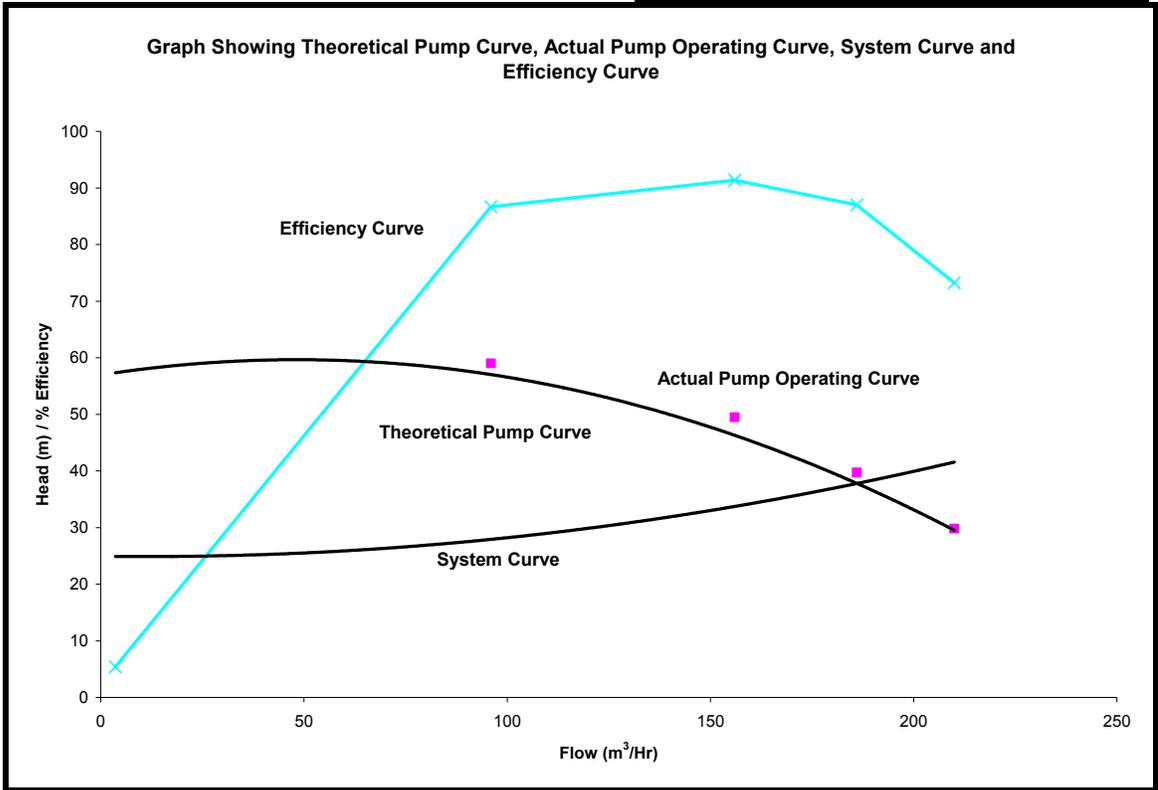
This site has five boreholes which are used in parallel. The Borehole characteristics are:

	BH 35A	BH35B	BH 35D	BH 35E
Borehole Depth:	35.9 m	36.7 m	39.6m	73m
Dynamic Water Level:	19.4 m	16.22 m	19.1 m	16.08 m
Safe Yield:	90 m ³ /Hr	180 m ³ /Hr	180 m ³ /Hr	310 m ³ /Hr
Installed Pump Hydraulic Capacity:	90 m ³ /Hr x 43 m x 21 kW	180 m ³ /Hr x 37 m x 26 kW	180 m ³ /Hr x 30 m x 22 kW	180 m ³ /Hr x 40 m x 26 kW
Pump Make:	KSB	Caprari	Caprari	Caprari
Date Installed:	12-08-94	31-01-06	22-11-99	10-11-04

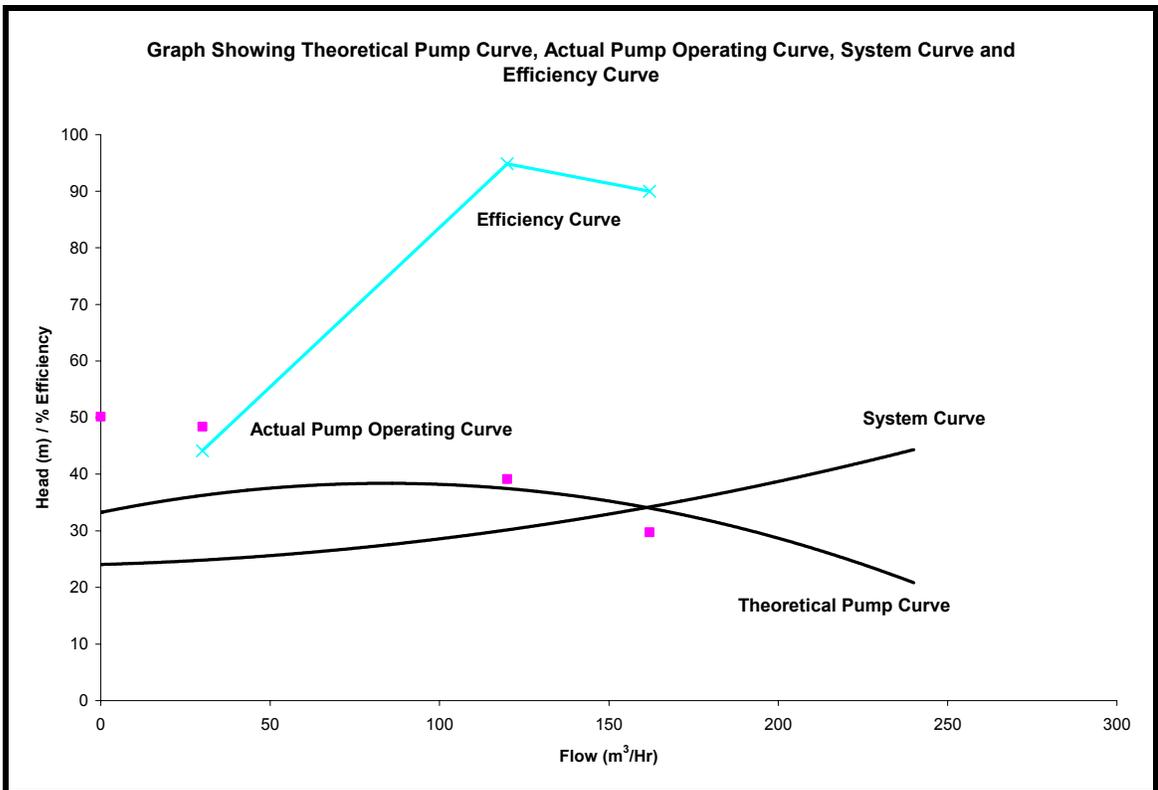


Holyrood 35 A

***Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II***

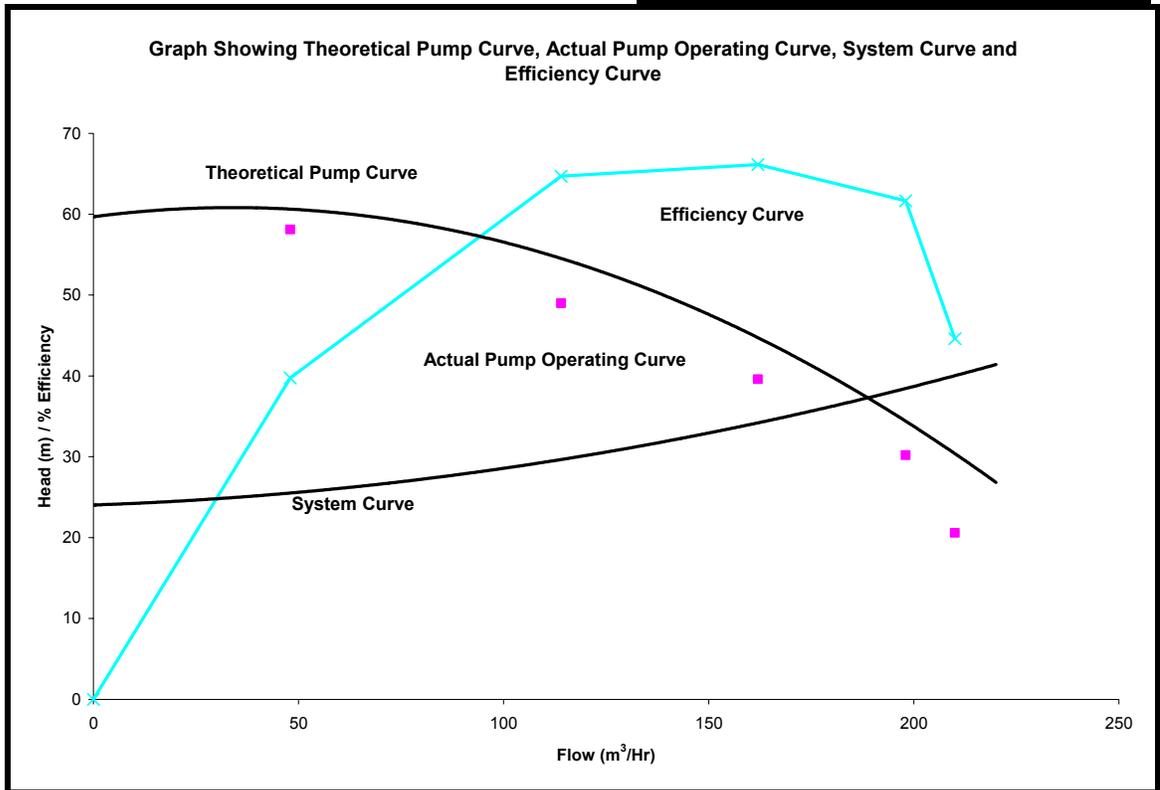


Holyrod 35 B



Holyrod 35D

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**



Holyrood 35E

Based on tests,

- The theoretical pump curve for this site is not available. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 50.6%.
- The pump for Holyrood 35B is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 73.2%.
- The pump for Holyrood 35D is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 90.2%.
- The pump for Holyrood 35E is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 61.6%.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Holyrood BH 826 (CEB Acc: 7C1530)

The Borehole characteristics are:

Borehole Depth: 102 m

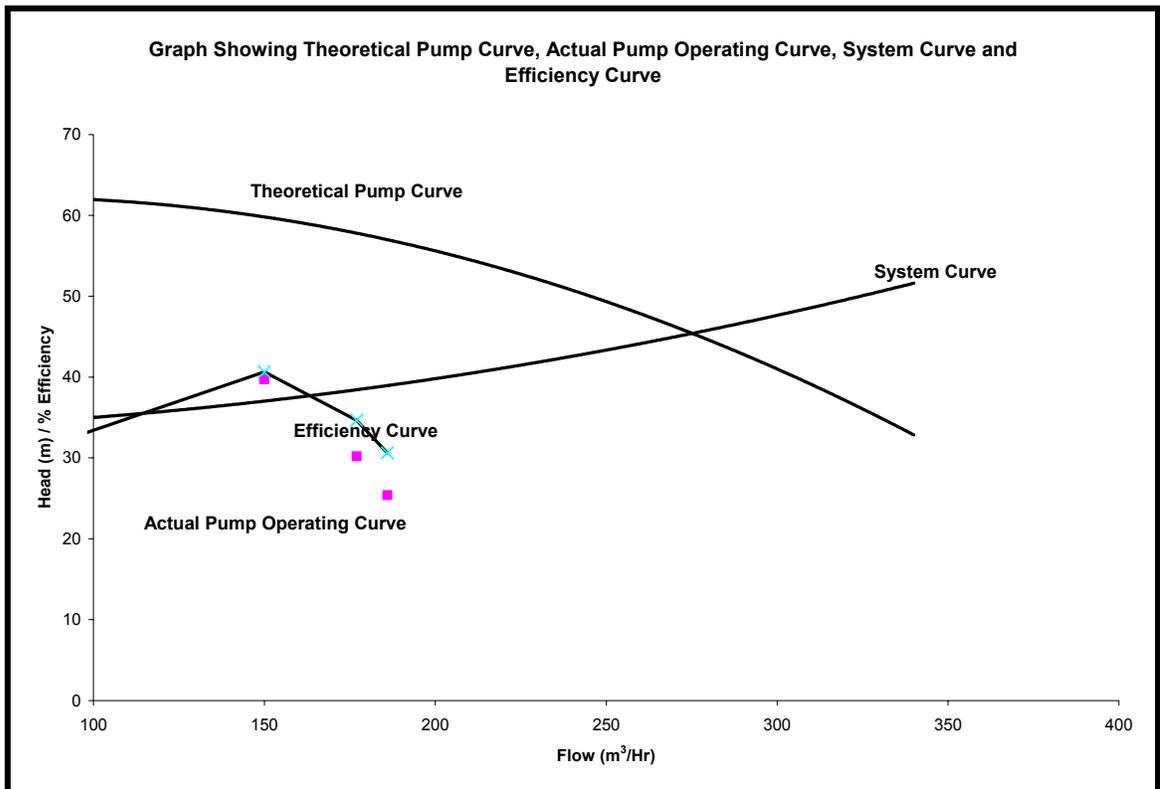
Dynamic Water Level: 27.57 m

Safe Yield: 243 m³/Hr

Installed Pump Hydraulic Capacity: 300 m³/Hr x 34 m x 45 kW

Pump Make: Caprari

Date Installed: 25-11-99



Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 30.6%. The recommended pump, based on a pump efficiency of 70% and available motor rating is 250 m³/Hr x 40 m x 45 kW

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Holyrood BH 947 (CEB Acc: 7C1530)

The Borehole characteristics are:

Borehole Depth: 87 m

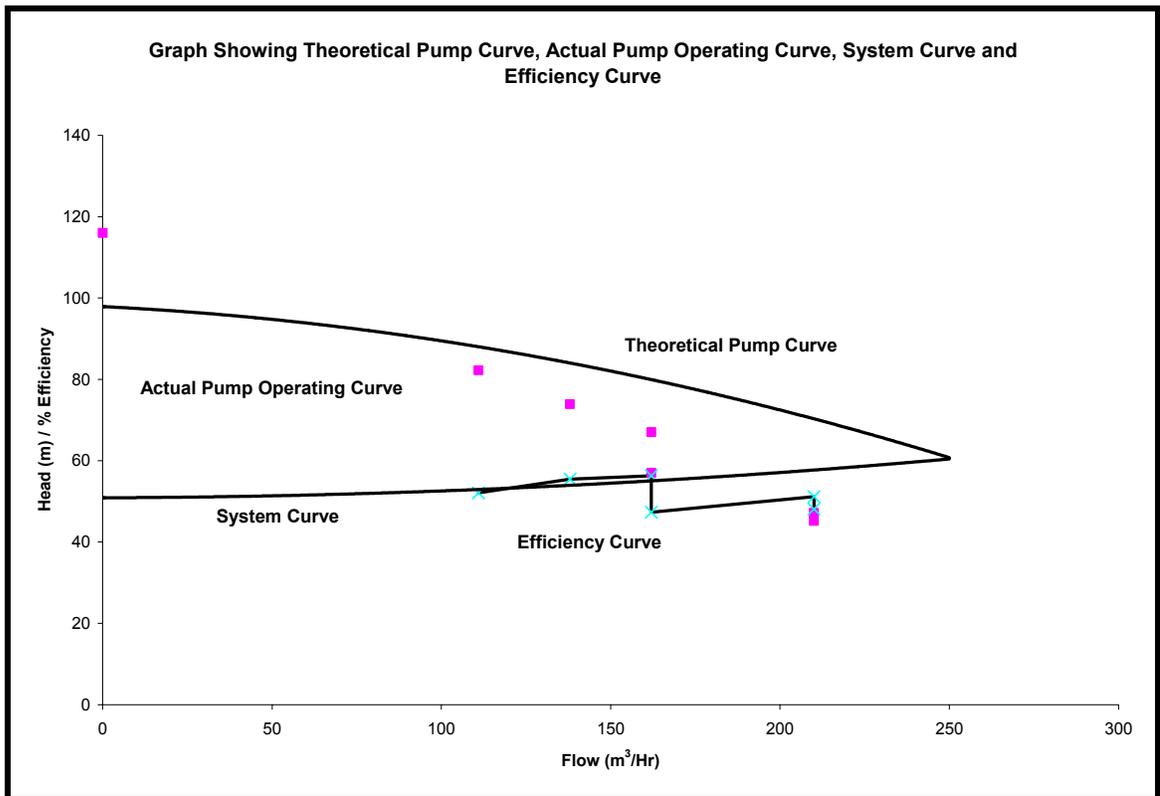
Dynamic Water Level: 32.46 m

Safe Yield: 220 m³/Hr

Installed Pump Hydraulic Capacity: 230 m³/Hr x 66 m x 55 kW

Pump Make: Caprari

Date Installed: 23-10-04



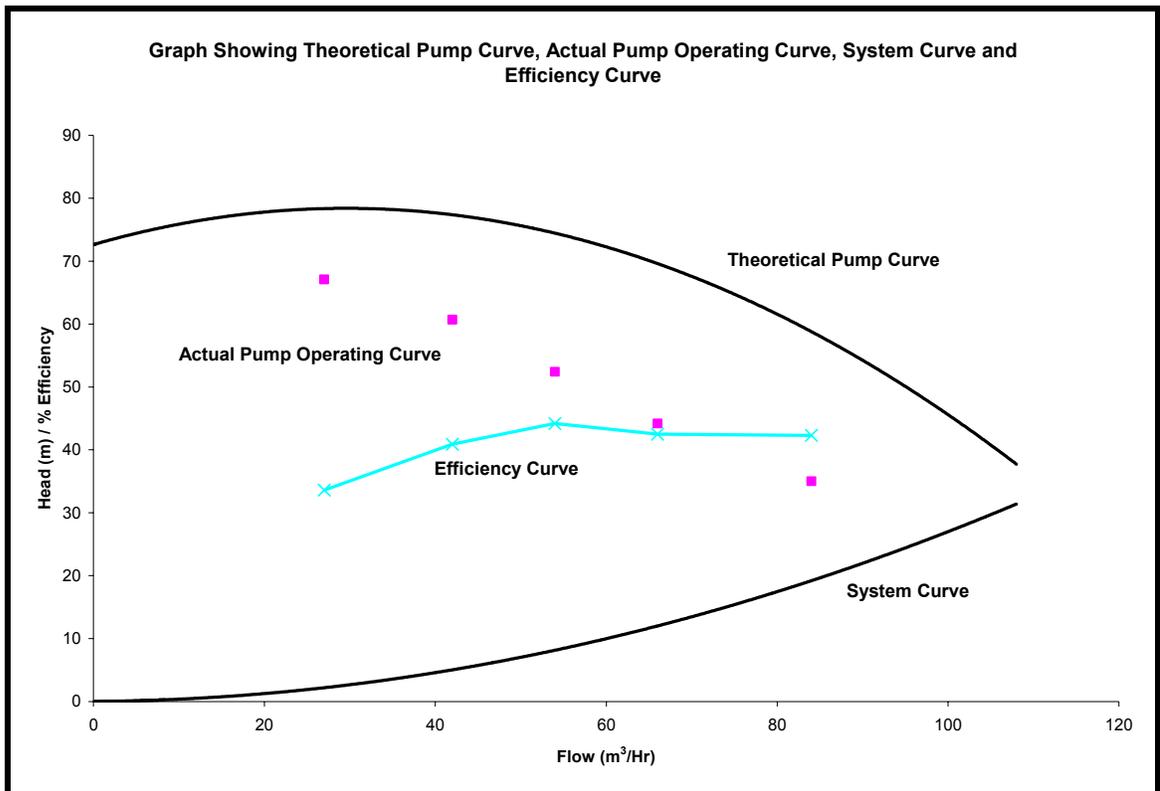
Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 51.2%.

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**

Bassin 435 & Palma BH 73(CEB Acc: 7C1831)

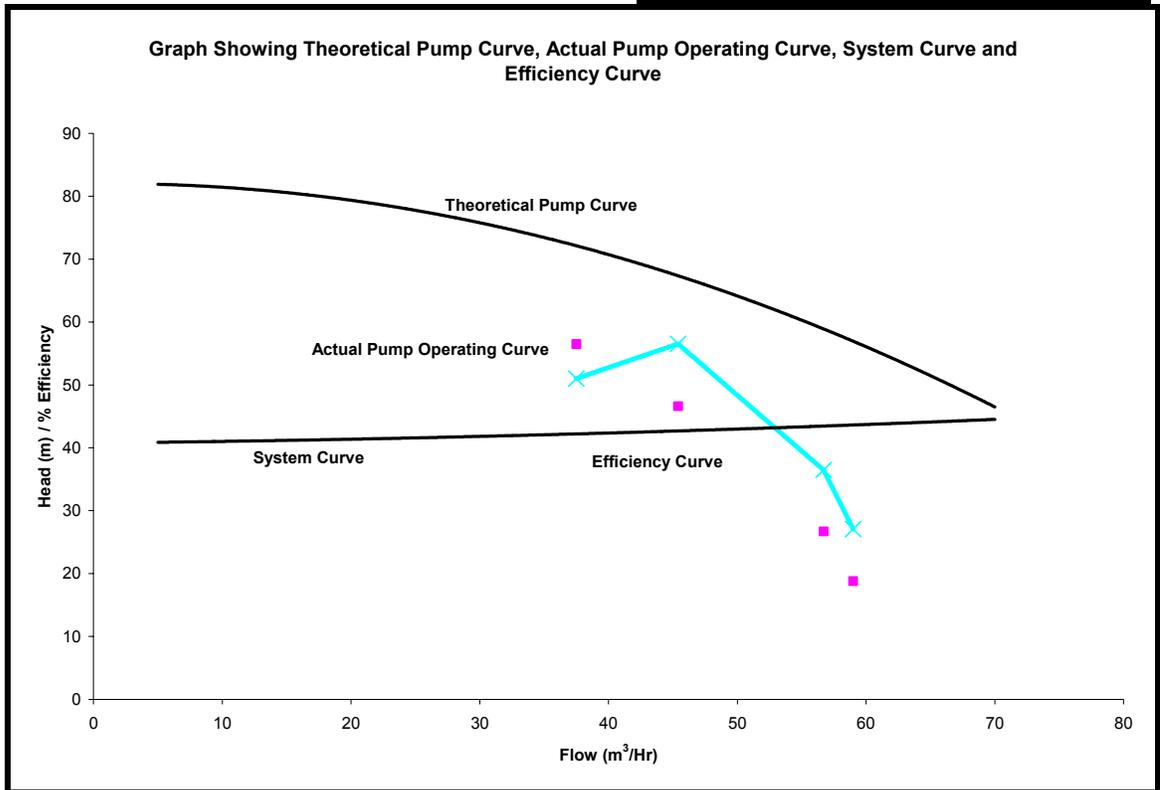
The Borehole characteristics are:

	BH 435	BH 73
Borehole Depth:	58 m	36.5 m
Dynamic Water Level:	44 m	16.8 m
Safe Yield:	90 m ³ /Hr	135 m ³ /Hr
Installed Pump Hydraulic Capacity:	90 m ³ /Hr x 54 m x 22 kW	55 m ³ /Hr x 60 m x 13 kW
Pump Make:	Caprari	Jetspa
Date Installed:	18-06-04	14-03-00



Bassin 435

**Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II**



Palma 73

Based on tests,

- It is found that the Pump for Bassin 435 is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 42.3%. this pump has been oversized so that it can be operated in parallel with the pump installed at Palma BH 73
- It is found that the pump for Palma 73 is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 54.4%.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Palmyre BH 26B (CEB Acc: 7C4198)

The Borehole characteristics are:

Borehole Depth: 36.58 m

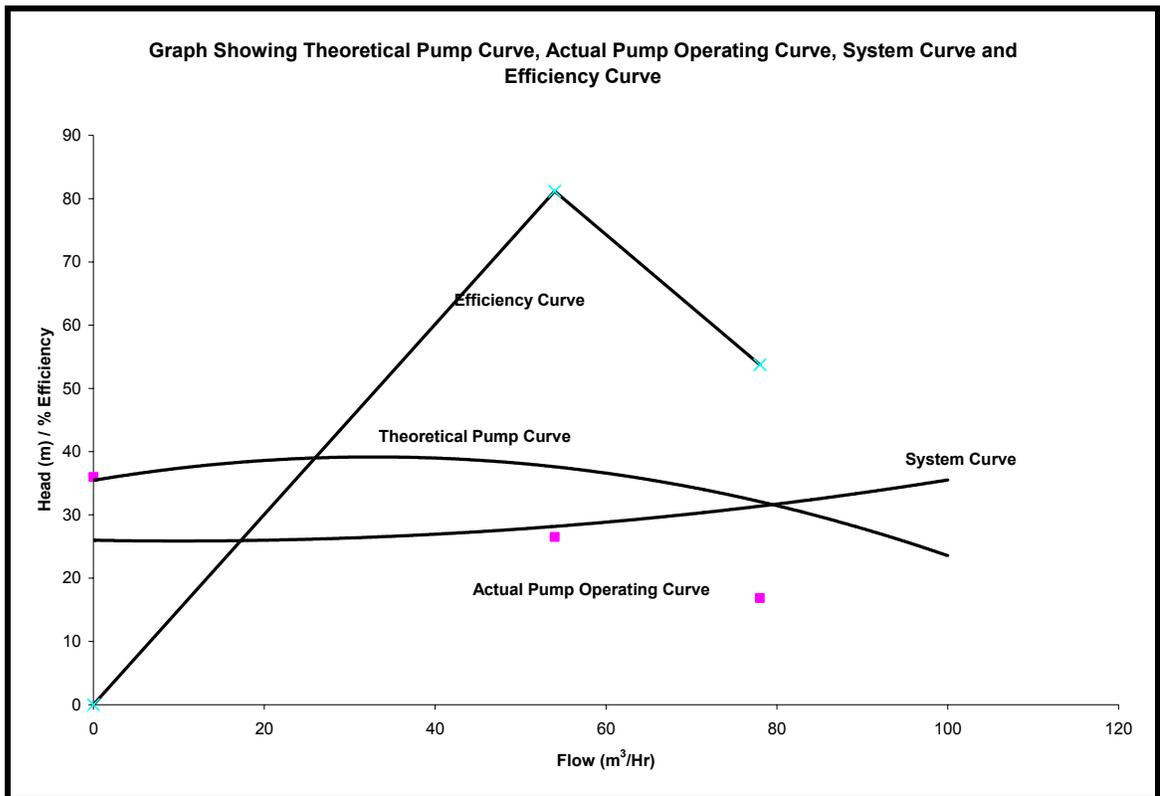
Dynamic Water Level: 16 m

Safe Yield: 66 m³/Hr

Installed Pump Hydraulic Capacity: 90 m³/Hr x 26 m x 9.2 kW

Pump Make: Caprari

Date Installed: 19-08-04



Palmyre 26B

Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 53.7%.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Palmyre BH 419 (CEB Acc:7130001303-6)

The Borehole characteristics are:

Borehole Depth: 37 m

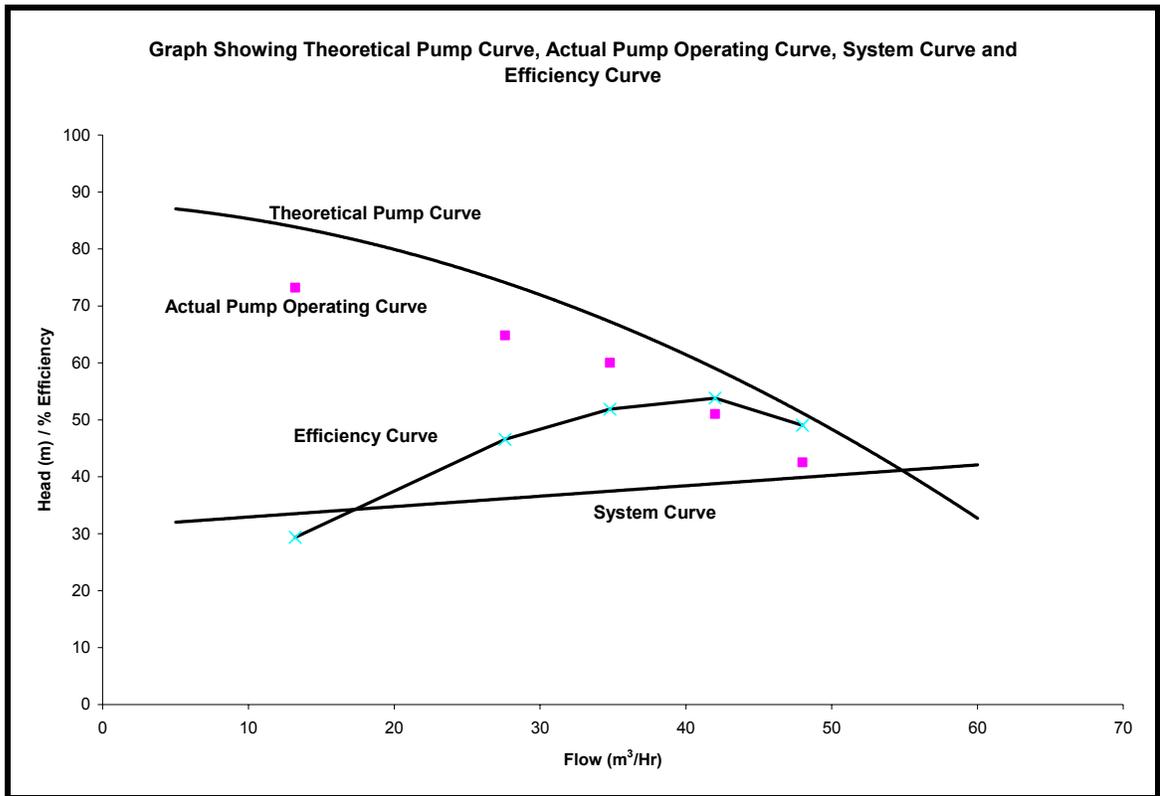
Dynamic Water Level: 23 m

Safe Yield: 54 m³/Hr

Installed Pump Hydraulic Capacity: 40 m³/Hr x 55 m x 11 kW

Pump Make: Super D

Date Installed: 15-05-97



Palmyre 419

Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 53.8%.

Project – Energy Auditing, Management & Efficiency at
CWA – Pumping Stations- Phase II

Palmyre BH 827 (CEB Acc:7C7469)

The Borehole characteristics are:

Borehole Depth: 117 m

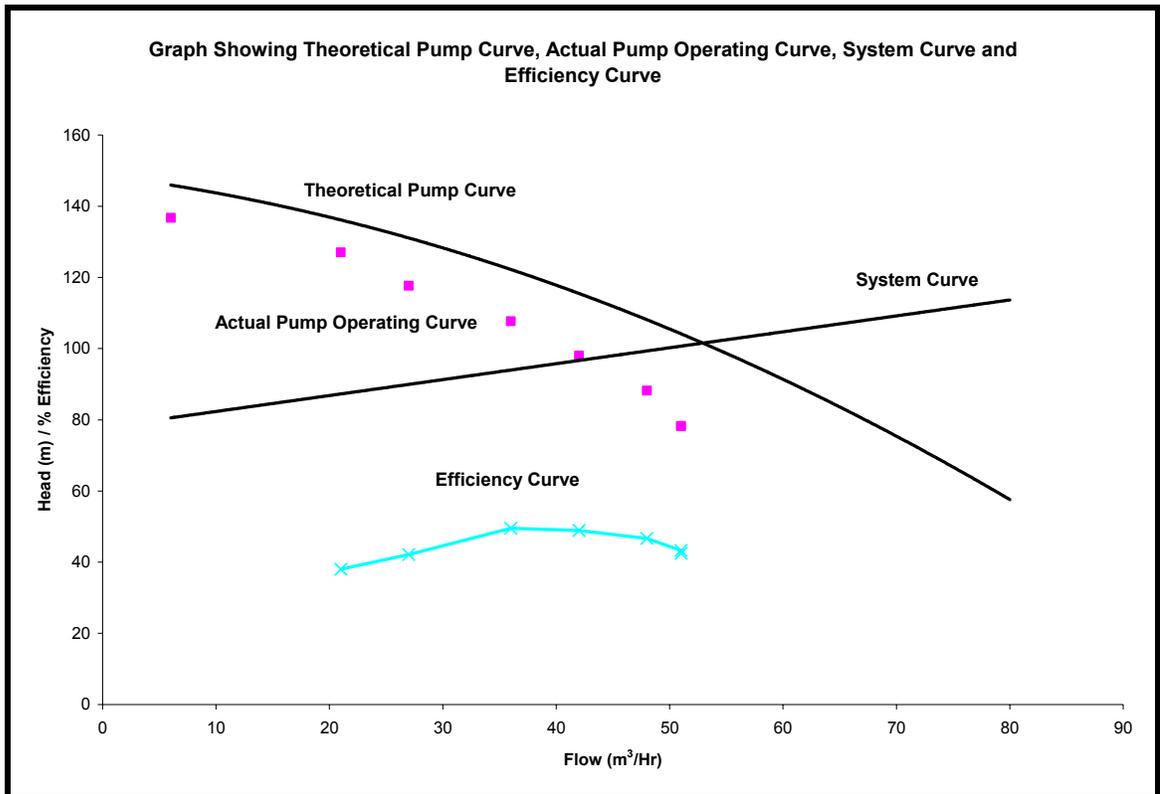
Dynamic Water Level: 69.5 m

Safe Yield: 60 m³/Hr

Installed Pump Hydraulic Capacity: 55 m³/Hr x 110 m x 26 kW

Pump Make: Rovatti

Date Installed: 22-02-02



Palmyre 827

Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 49.7%.

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Solferino BH 403 (CEB Acc: 7C6567)

The Borehole characteristics are:

Borehole Depth: 37.4 m

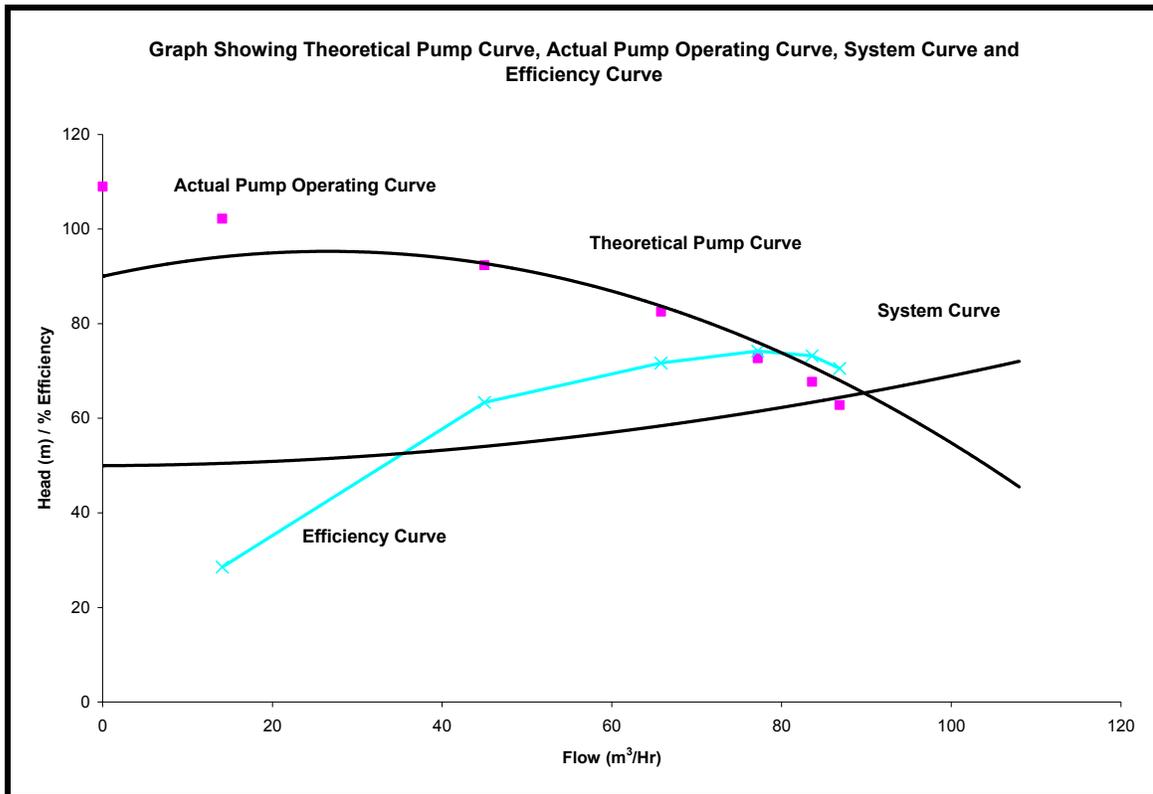
Dynamic Water Level: 23 m

Safe Yield: 70 m³/Hr

Installed Pump Hydraulic Capacity: 70 m³/Hr x 58 m x 22 kW

Pump Make: Caprari

Date Installed: 18-05-04

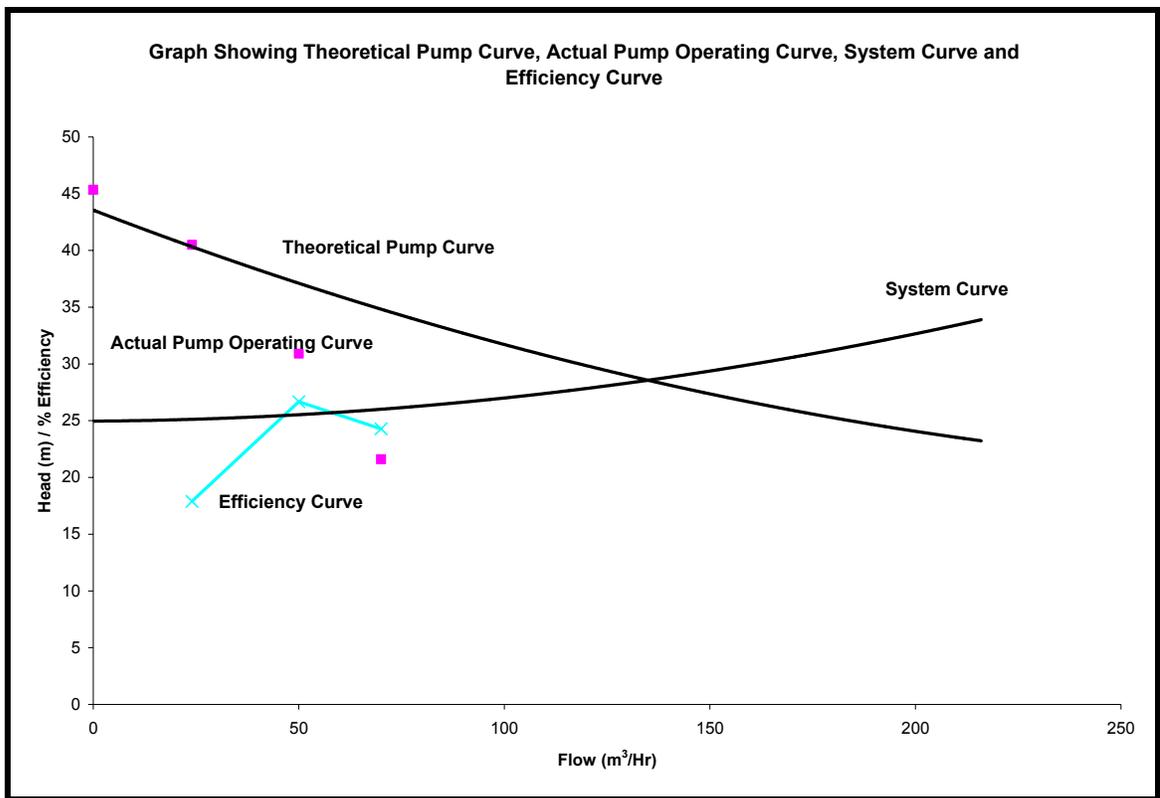


Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above safe yield. The efficiency of the pump at its operational point is 73.2%.

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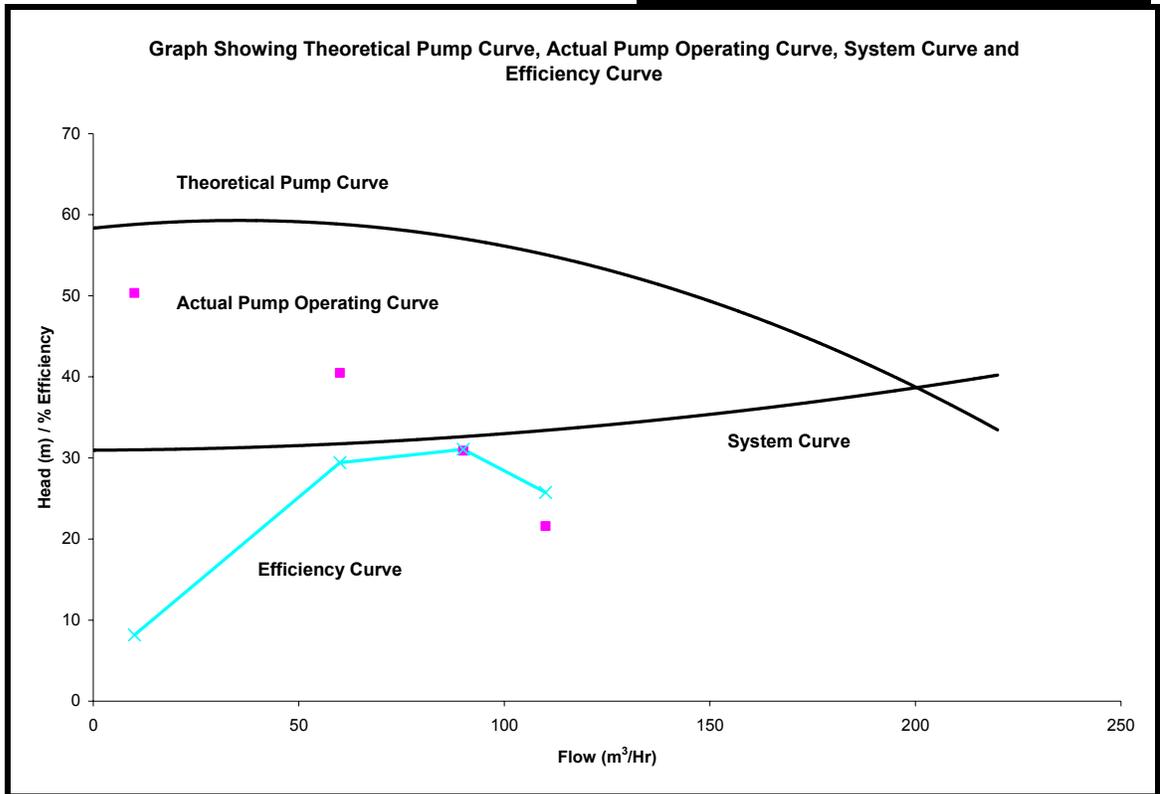
Solferino Dookhun BH 359A & 359B (CEB Acc: 7C1529)

	BH 359A	BH 359B
Borehole Depth:	34.25 m	38. m
Dynamic Water Level:	30.85 m	24.69 m
Safe Yield:	162 m ³ /Hr	162 m ³ /Hr
Installed Pump Hydraulic Capacity:	108 m ³ /Hr x 32 m x 19 kW	200 m ³ /Hr x 35 m x 30 kW
Pump Make:	British Pleuger	Caprari
Date Installed:	21-01-88	09-11-97



Solferino Dookhun BH 359A

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Solferino Dookhun BH 359B

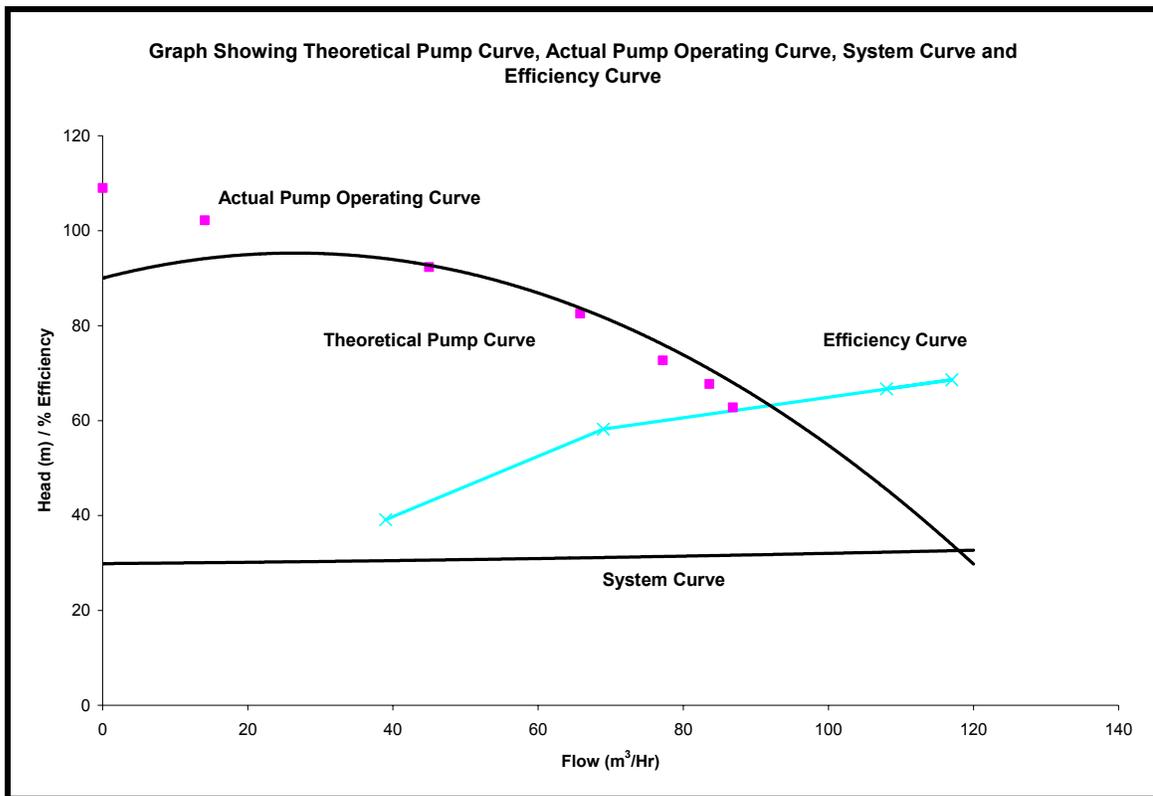
Based on tests,

- For Solferino Dookhun 359A, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 24.3%. . The required pump for this borehole based on a pump efficiency of 70% and available motor is 160 m³/Hr x 40 m x 22kW.
- For Solferino Dookhun 359B, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 25.7%. The required pump for this borehole based on a pump efficiency of 70% and available motor is 160 m³/Hr x 40 m x 22kW.

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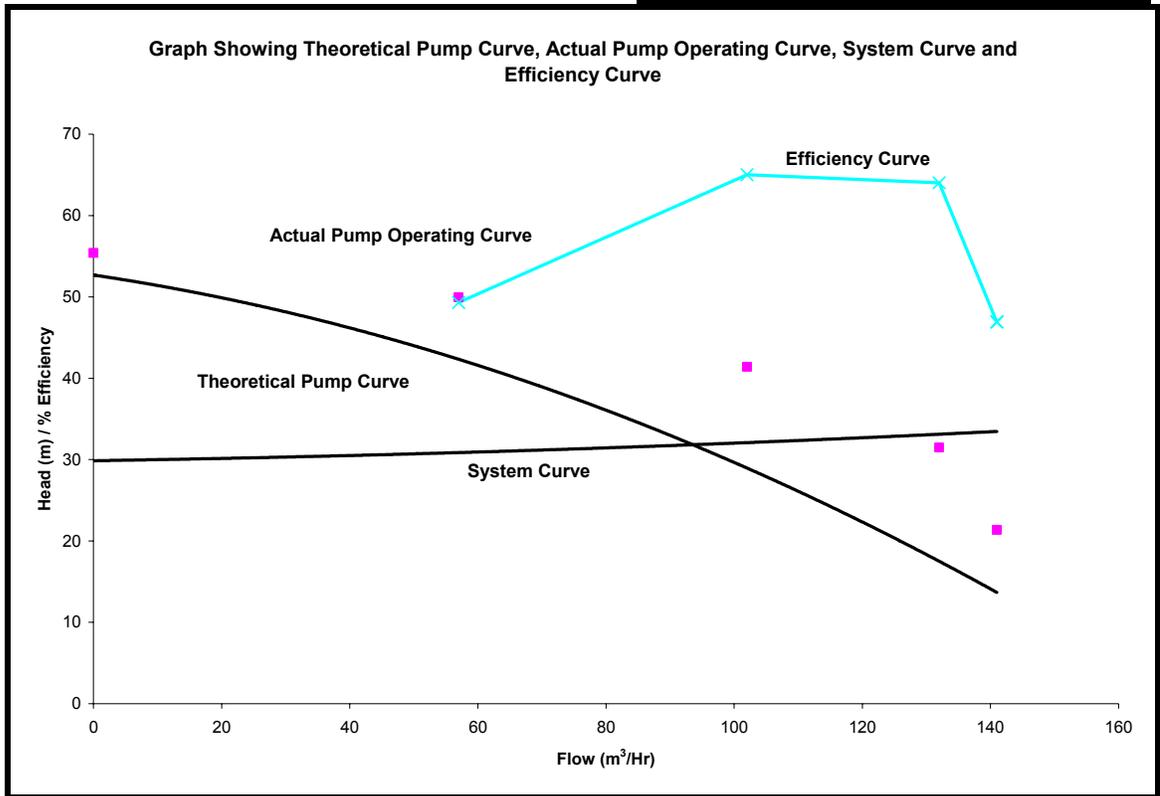
St Paul BH 153A & 153D (CEB Acc: 4C1120)

	BH 153A	BH 153D
Borehole Depth:	36.6 m	37.4 m
Dynamic Water Level:	23.5 m	29.2 m
Safe Yield:	102 m ³ /Hr	102 m ³ /Hr
Installed Pump Hydraulic Capacity:	125 m ³ /Hr x 30 m x 18.6 kW	125 m ³ /Hr x 35 m x 18.5 kW
Pump Make:	Hyward Tylor	Caprari
Date Installed:	19-02-94	01-03-02



St Paul 153A

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St Paul 153D

Based on tests,

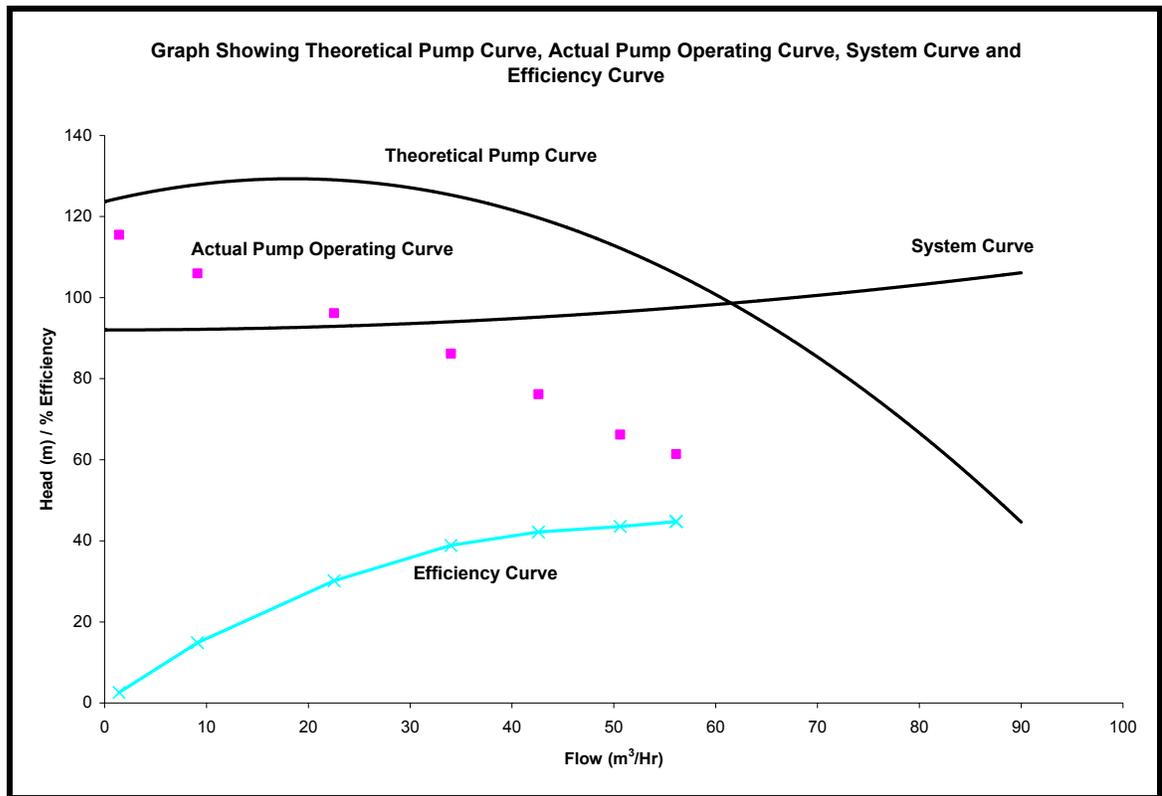
- For St Paul 153A, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 66.7%.
- For St Paul 153D, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 65%.

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Telfair BH 521(CEB Acc: 3C3811)

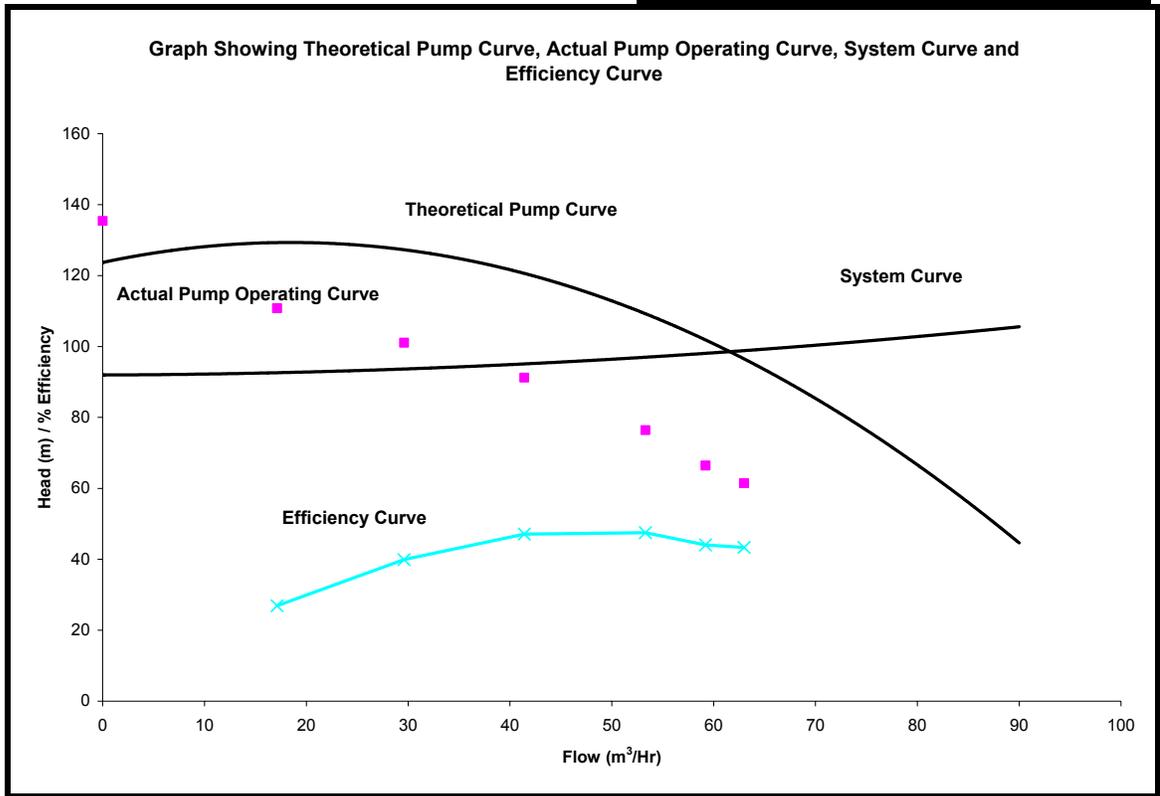
This site has two boreholes which operate in parallel and the Borehole characteristics are:

	BH 521	BH 531
Borehole Depth:	50 m	43.15 m
Dynamic Water Level:	29 m	29 m
Safe Yield:	60 m ³ /Hr	60 m ³ /Hr
Installed Pump Hydraulic Capacity:	55 m ³ /Hr x 100 m x 22 kW	72 m ³ /Hr x 100 m x 30 kW
Pump Make:	Caprari	Caprari
Date Installed:	28-09-00	05-03-99



Telfair 521

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Telfair 531

Based on tests,

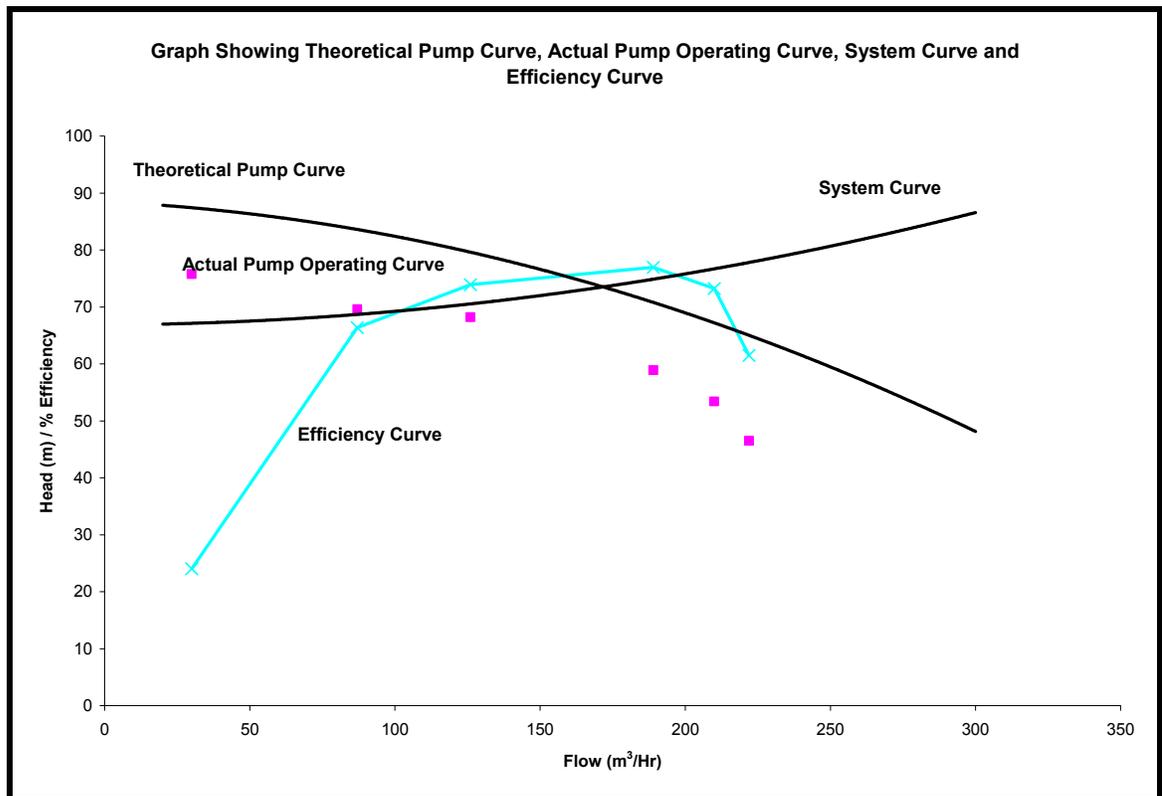
- For Telfair 521, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 44.8%. The required pump for this borehole based on a pump efficiency of 70% and available motor is 60 m³/Hr x 100 m x 22kW.
- For Telfair 531, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 43.4%. The required pump for this borehole based on a pump efficiency of 70% and available motor is 60 m³/Hr x 100 m x 22kW.

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Trianon BH 738 & 903 (CEB Acc: 7C7418)

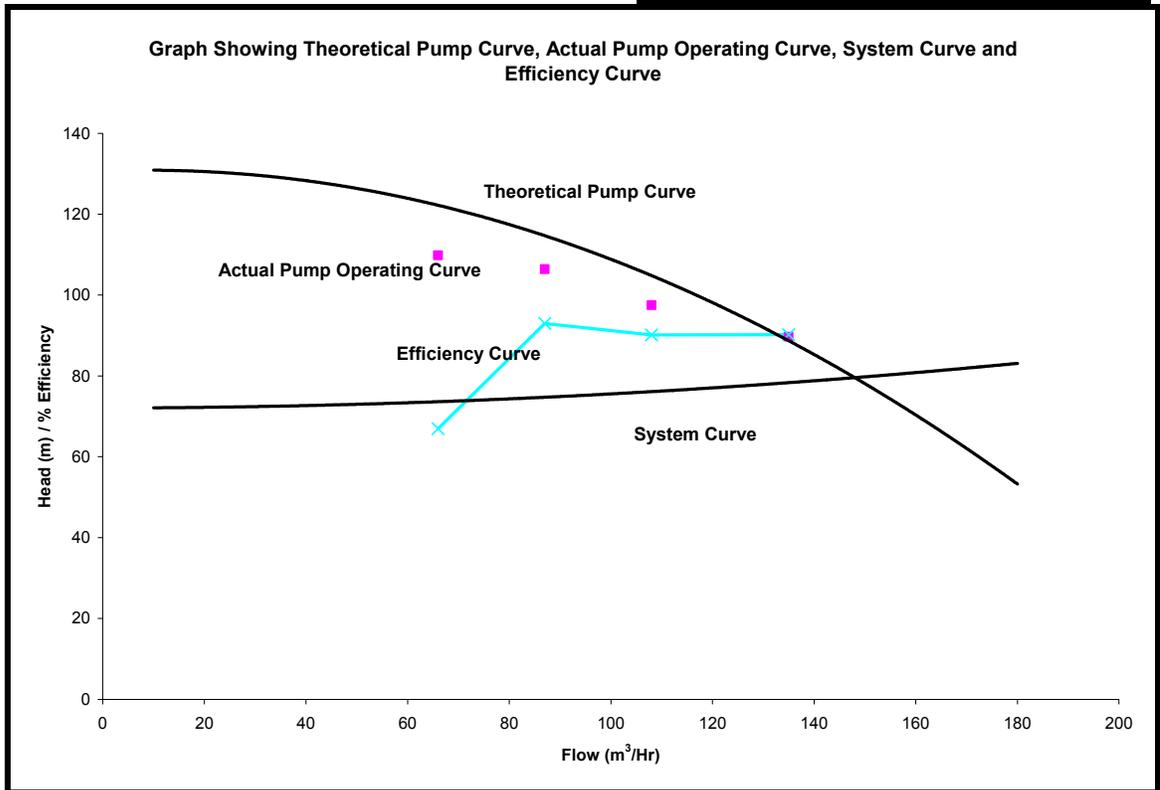
This site has two boreholes separated by a distance of 800 m and are operated in parallel. The Borehole characteristics are:

	BH 738	BH 903
Borehole Depth:	118.5 m	113 m
Dynamic Water Level:	42.9 m	55.7 m
Safe Yield:	246 m ³ /Hr	130 m ³ /Hr
Installed Pump Hydraulic Capacity:	250 m ³ /Hr x 60 m x 59 kW	135 m ³ /Hr x 80 m x 45 kW
Pump Make:	Caprari	Caprari
Date Installed:	11-11-99	09-11-04



Trianon 738

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Trianon 903

Based on tests,

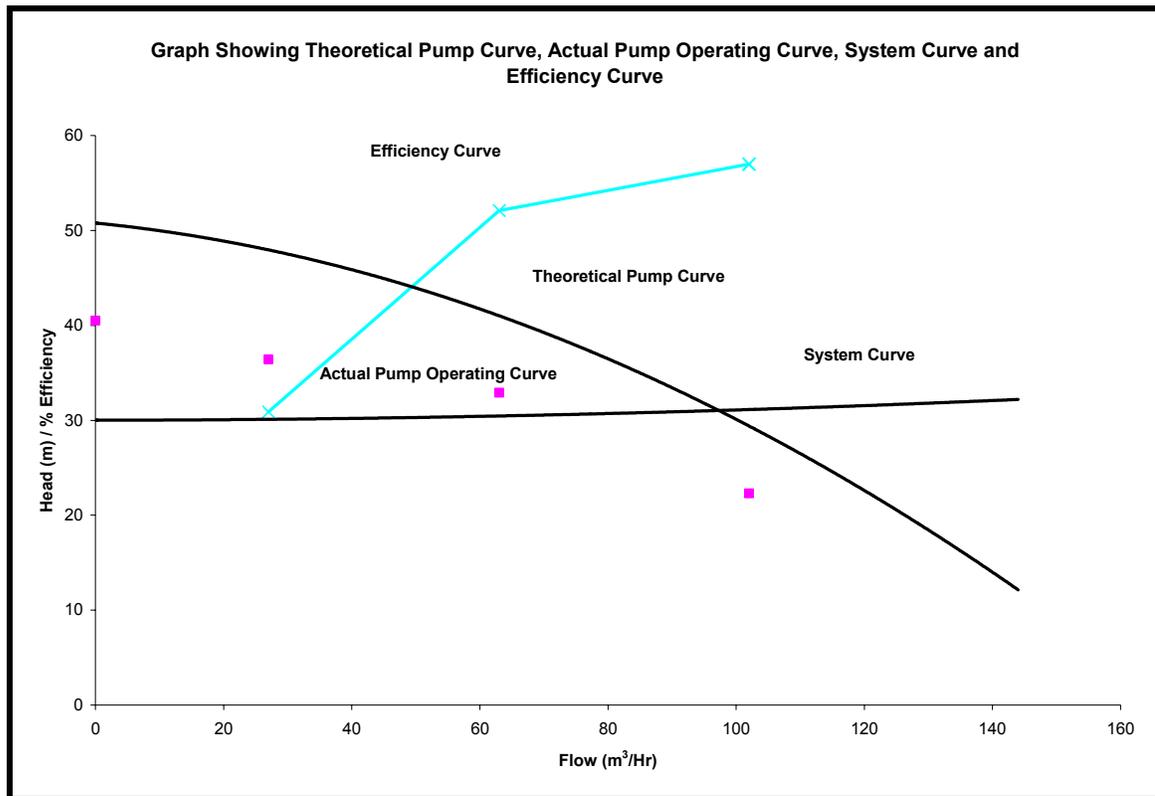
- For Trianon 738, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 61%.
- For Trianon 903, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 90%.

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Valentina (Lower) BH 390 & 390A (CEB Acc:7C4896)

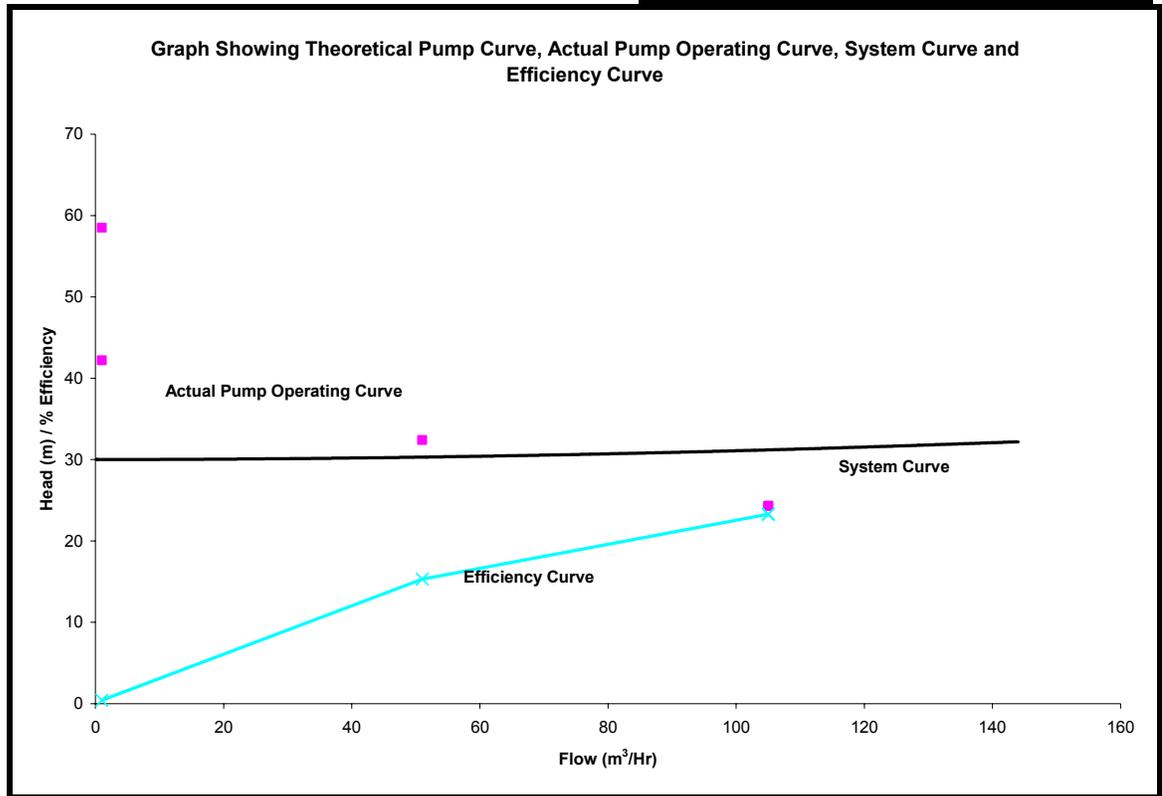
This site has two boreholes and only one is used at a time. The Borehole characteristics are:

	BH 390	BH 390A
Borehole Depth:	36 m	39.4 m
Dynamic Water Level:	6.8 m	6.86 m
Safe Yield:	116 m ³ /Hr	65 m ³ /Hr
Installed Pump Hydraulic Capacity:	100 m ³ /Hr x 30 m x 11 kW	182 m ³ /Hr x 37 m x 30 kW
Pump Make:	Caprari	British Pleuger
Date Installed:	14-10-02	18-12-87



Valentina 390

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Valentina 390A

Based on tests,

- For Valentina 390, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is below the safe yield. The efficiency of the pump at its operational point is 57%.
- For Valentina 390A, the theoretical pump curve is not available. This pump is being replaced by the Central Water Authority due to old age.

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Valentina BH 733 (CEB Acc:7C7352)

The Borehole characteristics are:

Borehole Depth: 57 m

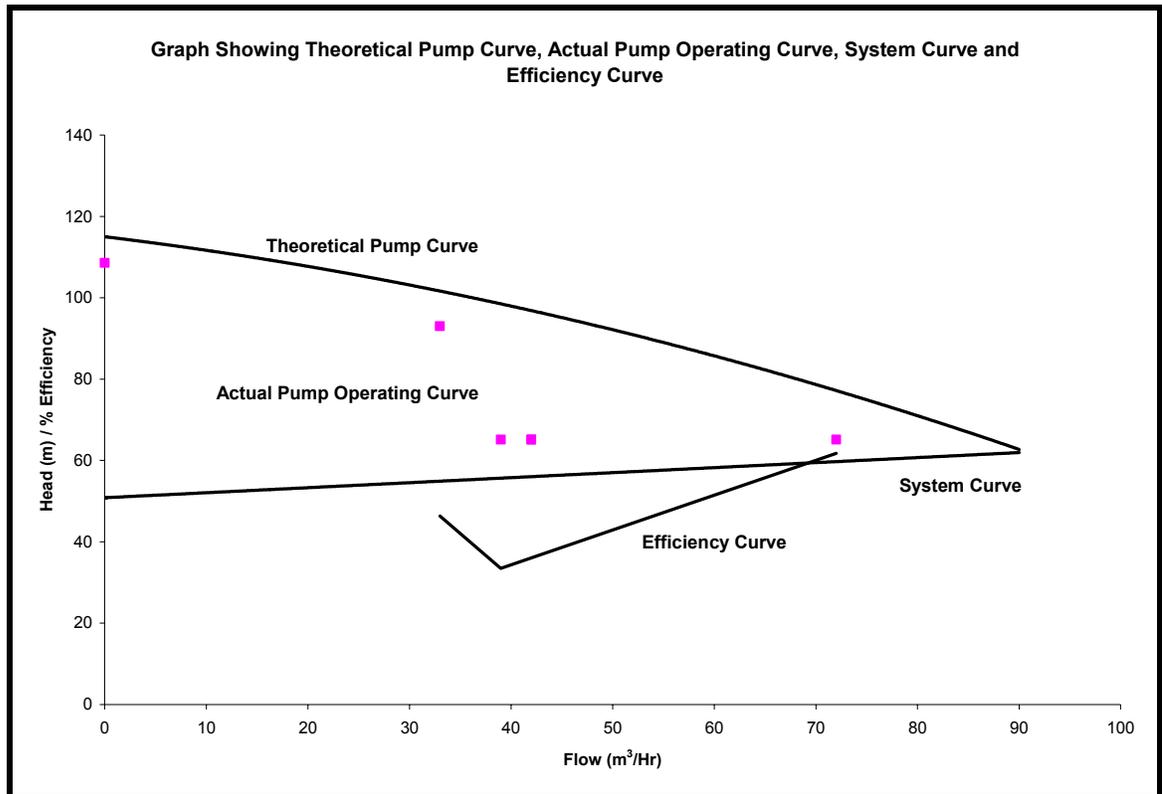
Dynamic Water Level: 34.2 m

Safe Yield: 78 m³/Hr

Installed Pump Hydraulic Capacity: 80 m³/Hr x 70 m x 22 kW

Pump Make: Jetspa

Date Installed: 01-10-99



Valentina 733

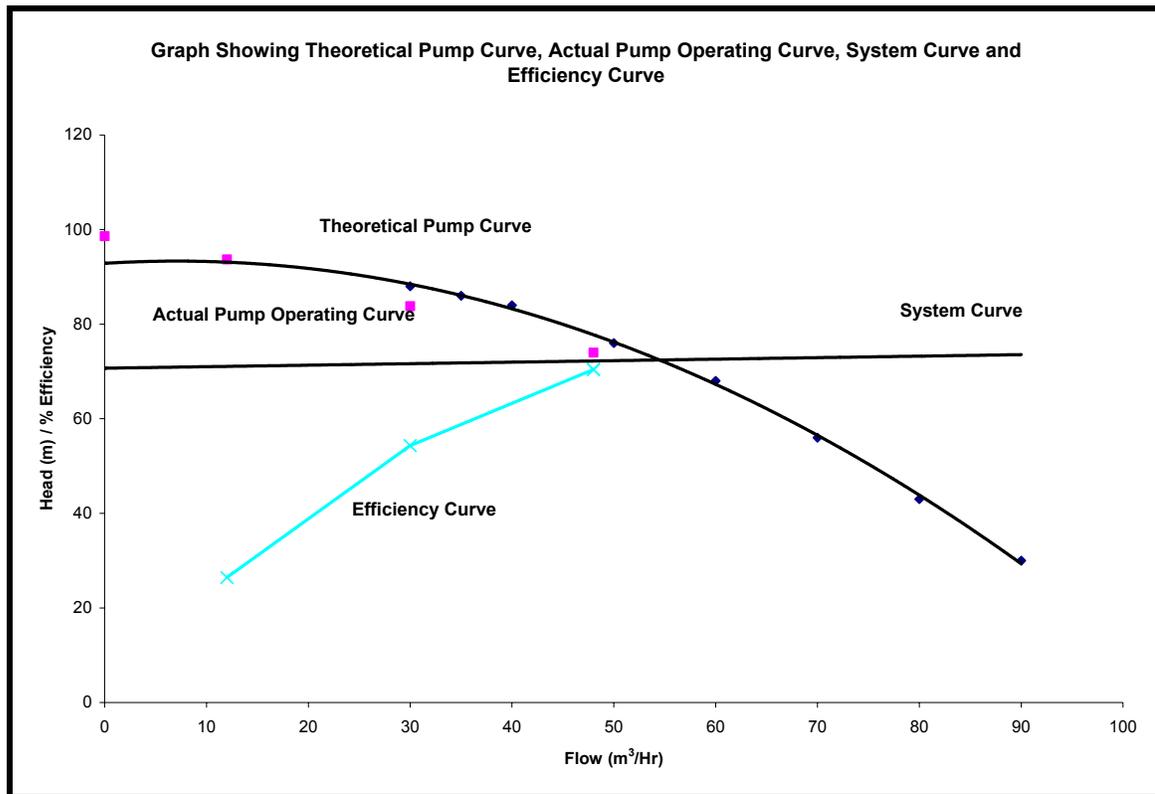
Based on tests, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is well above safe yield. The efficiency of the pump at its operational point is 61.8%.

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Yemen BH 594B & 569C (CEB Acc: 7C5296)

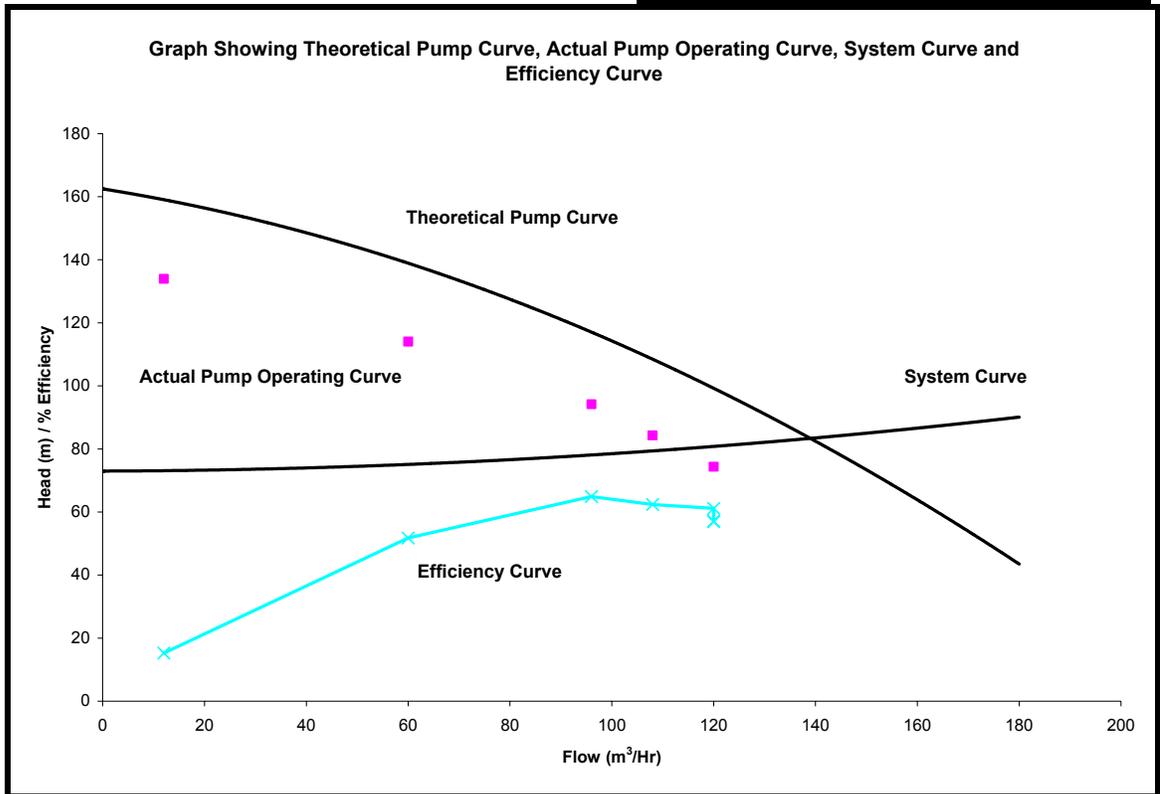
This site has two boreholes. Only one borehole is used at a time and the Borehole characteristics are:

	BH 594B	BH 569C
Borehole Depth:	23.5 m	24.86 m
Dynamic Water Level:	8.15 m	3.67 m
Safe Yield:	55 m ³ /Hr	96 m ³ /Hr
Installed Pump Hydraulic Capacity:	55 m ³ /Hr x 75 m x 15 kW	110 m ³ /Hr x 100 m x 45 kW
Pump Make:	Caprari	Rovatti
Date Installed:	16-05-00	01-11-05



Yemen 594 B

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Yemen 569C

Based on tests,

- For Yemen 594B, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near the safe yield. The efficiency of the pump at its operational point is 57%.
- For Yemen 569C, it is found that the Installed Pump Hydraulic Capacity is not operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is above the safe yield. The efficiency of the pump at its operational point is 70.4%.

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Yemen BH 853 (CEB Acc: 7C6567)

The Borehole characteristics are:

Borehole Depth: 19 m

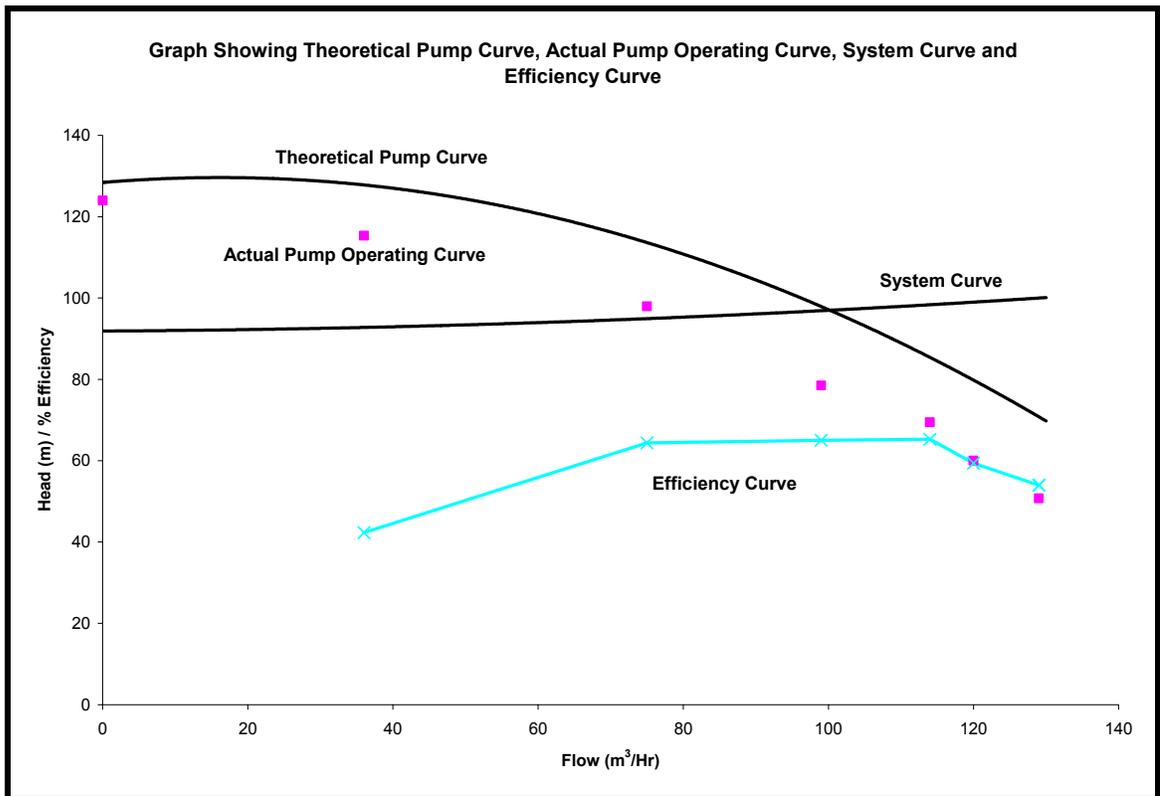
Dynamic Water Level: 9.31 m

Safe Yield: 110 m³/Hr

Installed Pump Hydraulic Capacity: 110 m³/Hr x 100 m x 37 kW

Pump Make: Saer

Date Installed: 27-10-05



Based on tests, it is found that the Installed Pump Hydraulic Capacity is operating near its theoretical pump curve. The intersection between the system curve and theoretical pump curve is near safe yield. The efficiency of the pump at its operational point is 65.3%.

CHAPTER 3

Summary of Results

3.1 Introduction.

This chapter relates to a summary of findings observed at Chapter 2 and the calculation of the energy savings that can be realized.

3.2 Pumps requiring replacement but with no expected energy savings.

Based on the pumping tests carried out on the different submersible pumps being used at the Central Water Authority (CWA) all pumps, having an efficiency of below 50% at its operational point, have been recommended for replacement. The replacement of these pumps will not lead directly to energy savings but their outputs (flow & head delivered) will increase and it will bring additional revenue to the CWA.

Pumps having the required hydraulic rating, but having an oversized motor and also a low pumping efficiency have been included in this list. The replacement of these pumps will not lead to energy savings despite the motor power rating being oversized by a single step of available motors; such electrical consumption of this oversized motor is comparable to the correct sized motor.

It is also included in this list the oversized standby pumps. Although, the replacement pump is smaller in size, no expected savings is derived from these as the original pump has not been in use.

These concerned sites are given hereunder:

a) M&E (North)

Ser No	Site	BH No	Installed Pump Capacity (m³/hr x m x kW)	Installed Pump Make/Origin	Recommended Pump Capacity (m³/hr x m x kW)
1	Camp La Boue	SW26	20 x 75 x 5.6	Super D	25 x 80 x 15
2	Fond Du Sac (Forbach)	743	240 x 60 x 55	Rovatti	260 x 70 x 70
3	Mapou	558	75 x 75 x 20	Caprari	65 x 85 x 22

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b) M&E (South)

Ser No	Site	BH No	Installed Pump Capacity (m³/hr x m x kW)	Installed Pump Make/Origin	Recommended Pump Capacity (m³/hr x m x kW)
1	Barkly BH	664	180 x 80 x 51	Caprari	180 x 80 x 42
2	Ebene	477	55 x 70 x 13	Saer	60 x 40 x 11
3	Clairfonds	176A	180 x 40 x 26 kW	Caprari	90 x 50 x 22
4	Solferino (Dookhun)	359A	108 x 32 x 19 kW	British Pleuger	160 x 40 x 22
5	Telfair	521	55 x 100 x 22 kW	Caprari	60 x 100 x 22
6	Telfair	531	72 x 100 x 30 kW	Caprari	60 x 100 x 22

3.3 Replacement of oversized Pumps

From the analysis done at chapter 2, it was also observed that certain submersible pumps are oversized with regard to the hydraulic capacity. The sizing of the pump has been done based on the system curve of the distribution line and the safe yield of the borehole. The replacement of these pumps will reduce the electrical consumption and thus it will make potential savings of electrical energy cost to the CWA. The expected savings cost is calculated using the following formula and is based on CEB Tariff 313 for maximum kVA demand for industrial consumers:

Annual Savings (Rs) = Savings on Active Billing + Savings on Maximum kVA Demand.

Savings on Active Billing = Power Savings (kW) x 24hrs x 365days x Rs 2.08per kWh

Savings on Maximum kVA Demand = (Power Savings (kW) / 0.8) x Rs105per kVA x 12Months

- The concerned pumps requiring replacement are given hereunder: -

M&E (North)

Ser No	Site	BH No	Installed Pump capacity (m³/hr x m x kW)	Recommended Pump capacity (m³/hr x m x kW)	Expected Power Savings (kW)	Expected Annual Savings (kWh)	Expected Annual Savings (Rs)
1	Beau Bois	825	50 x 150 x 30	40 x 100 x 18.5	11.5	100,740	227,651.70
2	Beau Bois	76B	20 x 91 x 11	15 x 80 x 7.5	3.5	30,660	69,285.30
3	St Martin	367B	120 x 90 x 45	120 x 50 x 26	19	166,440	376,120.20
4	Bois Mangues	12	60 x 70 x 22	50 x 60 x 15	7	61,320	138,570.60

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Ser No	Site	BH No	Installed Pump capacity (m ³ /hr x m x kW)	Recommended Pump capacity (m ³ /hr x m x kW)	Expected Power Savings (kW)	Expected Annual Savings (kWh)	Expected Annual Savings (Rs)
5	Haute Rive	391B	80 x 70 x 22	60 x 70 x 18.5	3.5	30,660	69,285.30
6	La Clemence	692	60 x 70 x 22	50 x 60 x 15	7	61,320	138,570.60
7	Morcellement	309A	45 x 40 x 11	45 x 40 x 7.5	3.5	30,660	69,285.30
8	Morcellement	309B	25 x 40 x 9.2	46 x 40 x 7.5	1.7	14,892	33,652.86
10	Camp Thorel	754	330 x 105 x 132	240 x 110 x 110	22	192,720	435,507.60
11	Esp Trebuchet	537A	90 x 55 x 18.5	110 x 35 x 15	3.5	30,660	69,285.30
12	Fond Du Sac	No1	100 x 95 x 30	72 x 80 x 22	8	70,080	158,366.40
13	Poudre D'Or	752	306 x 70 x 75	270 x 60 x 65	10	87,600	197,958.00
14	Poudre D'Or	123(i)	50 x60 x 15	60 x40 x 11	4	35,040	79,183.20
15	Poudre D'Or	123(iii)	180 x40 x 26	120 x40 x 22	4	35,040	79,183.20
16	Poudre D'Or	123(iv)	180 x40 x 30	180 x40 x 26	4	35,040	79,183.20
17	Petite Retraite		275 x65 x 66	210 x40 x 32	34	297,840	673,057.20
18	Petite Retraite		150 x80 x 45	210 x40 x 32	13	113,880	257,345.40
19	Laventureure	11A	20 x 90 x 18.5	30 x80 x 11 kW	7.5	65,700	148,468.50
20	Bonne Mere	492A	275 x 75 x 75	275 x 60 x 66	9	78,840	178,162.20
21	Bonne Mere	492B	275 x 75 x 75	275 x 60 x 66	9	78,840	178,162.20
Total Savings Envisaged						1,617,972	3,656,284.26

M&E (South)

Ser No	Site	BH No	Installed Pump capacity (m ³ /hr x m x kW)	Recommended Pump capacity (m ³ /hr x m x kW)	Expected Power Savings (kW)	Expected Annual Savings (kWh)	Expected Annual Savings (Rs)
1	Cluny	217A	300 x 60 x 92	300 x 40 x 52	40	350,400	791,832.00
2		217B	275 x 75 x 92	300 x 40 x 52	40	350,400	791,832.00
3		217C	393 x 40 x 75	300 x 40 x 52	23	201,480	455,303.40
4	Gebert	667	150 x 80 x 45	150 x 60 x 37	8	70,080	158,366.40

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Ser No	Site	BH No	Installed Pump capacity (m ³ /hr x m x kW)	Recommended Pump capacity (m ³ /hr x m x kW)	Expected Power Savings (kW)	Expected Annual Savings (kWh)	Expected Annual Savings (Rs)
5	Mon Desert Mon Tresor	548A	30 x 50 x 7.5	30 x 30 x 5.5	2	17,520	39,591.60
6		548B	45 x 40 x 7.5	30 x 30 x 5.5	2	17,520	39,591.60
7	Eau Bonne No2	247B	275 x 75 x 75	160 x 90 x 56	19	166,440	376,120.20
8	Barkly SP	501	90 x 100 x 37	90 x 90 x 32	5	43,800	98,979.00
9	Solferino Dookhun	359B	200 x 35 x 30	160 x 40 x 22	8	70,080	158,366.40
Total Savings Envisaged						1,287,720	2,909,982.60

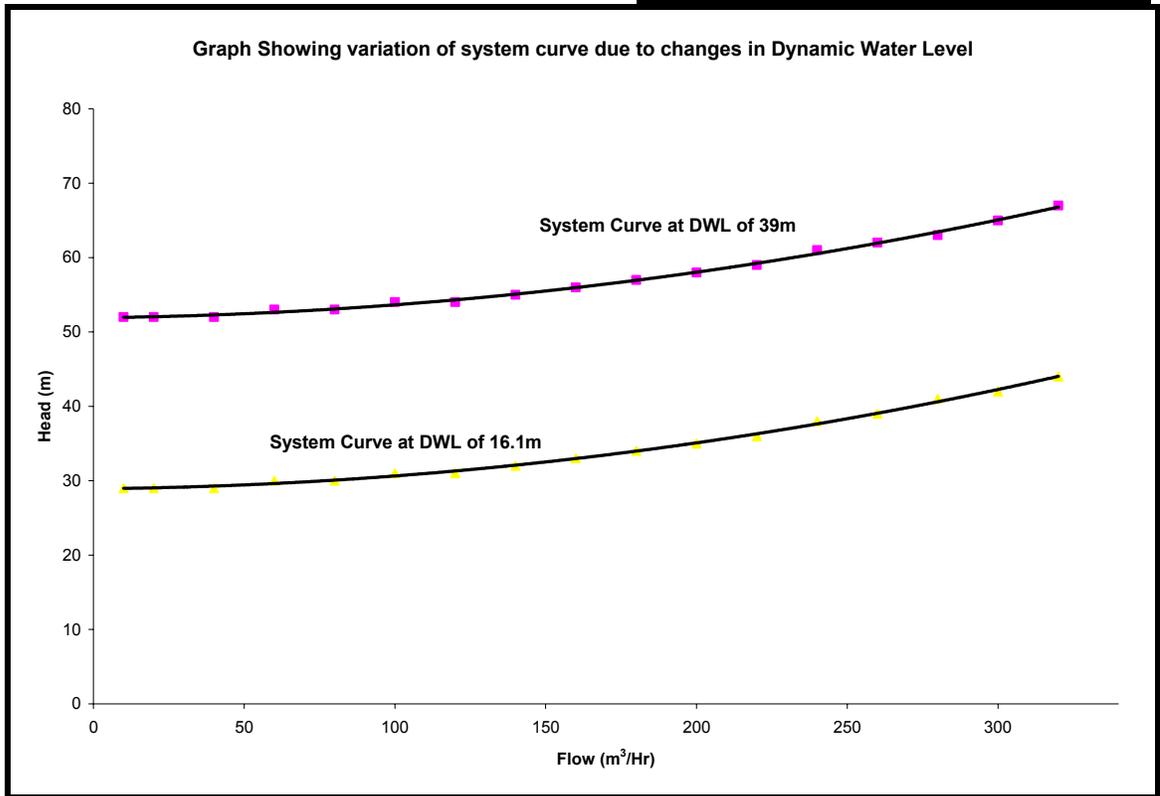
3.4 Variable Speed Drives.

An ideal distribution system is such that a submersible supplies to a service reservoir and the latter feeds the distribution mains by gravity. However, this case is not always possible and the Central Water Authority has around 19 sites, whereby the submersible pump is connected directly in the distribution mains. In such cases, the System Curves vary due to additional restriction being added on the consumption at the end of the distribution line. For such cases, as described at ‘chapter 1’ additional energy savings can be done by using a variable speed drive (VSD) unit to operate the submersible pump. This operation is a closed loop control using a pressure feedback from a Pressure Transducer installed on the distribution line, i.e. the VSD will read the pressure in the distribution line and it will compensate any rise in pressure that occurs during the night, by running the submersible pump at a lower speed. Likewise, during the daytime the variable speed drive will run the submersible pump at a higher speed when the pressure on the distribution line falls.

The Variable Speed Drive will provide the following advantages:

- Reduced power consumption of the pump
- Reduced leakage (by running the submersible pump at a lower speed, and pressure)
- Increased lifetime of the submersible pump.

As per comments made at para 3.5 above and 1.10 in chapter 1, to cater for changes in the characteristic of the distribution line due to variation in Dynamic Water level. For instance, in wet season the Dynamic Water Level at Holyrood BH35E is 16.1m and it drops down to 39m in dry season. The System Curves for these two situations are given hereunder: -



Under such situation, at a Dynamic Water Level of 16.1m, the installed submersible pump will deliver the rated flow, but when the Dynamic Water Level drops, in order to compensate the static head required, the flow (Q - m³/hr) will be lower. In order to avoid such situation, and have maximum exploitation of the borehole, it is recommended to oversize the hydraulic capacity of the submersible pump. Thus, it is recommended to use a Variable Speed Drive fitted to the existing submersible pump. During wet season, the submersible pump is made to run at a lower speed and during dry season, when the Dynamic Water level drops, the pump speed is then accelerated to compensate the additional required static head.

However, this proposal needs to be fully investigated by an onsite test as and when the water level drops down; the borehole yield is expected to decrease. The contribution of the Water Resources Unit shall be required to assist the proposed test.

3.5 Calculation for over sizing of pump to compensate drop in Dynamic Water Level

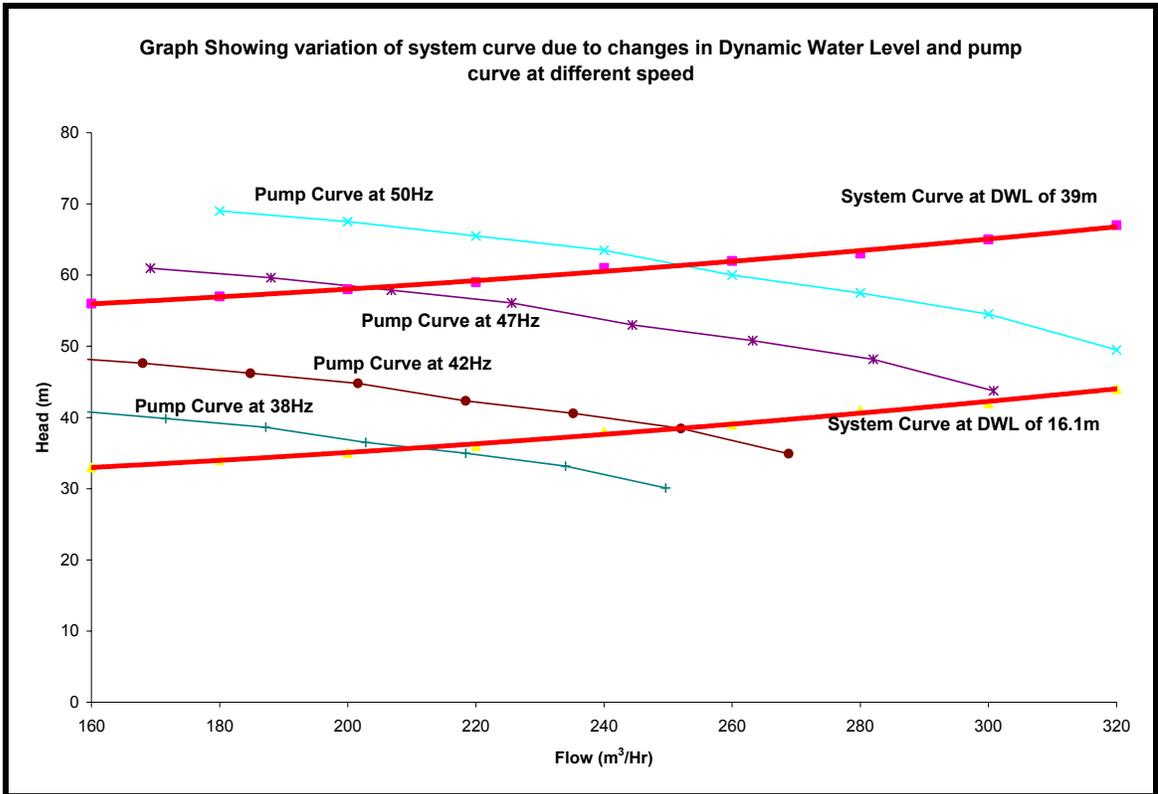
Pump Manufacturers recommend that a submersible pump shall not be operated at a speed frequency lower than 35Hz so that cooling of the electric motor is not affected. Thus, the pump is designed to work at a frequency of 35Hz during wet seasons. A typical example is Holyrood BH 35E,

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At a DWL of 16.1m the recommended pump capacity is 180 m³/hr x 40m at 35 Hz

Using laws of Affinity, the recommended pump becomes 260 m³/hr x 60m at 50Hz.

The variation of the pump curve rated at 260 m³/hr x 60m (Caprari E10S64-2A) running at different speeds is shown below:



The different sites recommended for operation with Variable Speed Drive are as follows:

- Sites pumping directly into the distribution mains are listed hereunder:-

Ser No	Site	Region Served	Ser No	Site	Region Served
1	Cottage (New) BH 564	Surroundings	11	La Clemence BH 692	Surroundings
2	Fond Du Sac (Choisy) BH 643	Grand Baie & Trou Aux Biches	12	P D'Or No2 BH 123 (ii)	Surroundings
3	Mapou BH558	Surroundings	13	Solitude BH 748	Triolet (7 ^{eme} Mile)

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Ser No	Site	Region Served	Ser No	Site	Region Served
4	Riche Terre BH 36	Surroundings	14	Laventure BH 11A	Surroundings
5	Camp Ithier BH 815	Surroundings	15	Gebert BH 667	Mare D’Albert
6	Choisy / Baie Du Cap BH 776	Surroundings	16	Mon Loisir BH 720	Surroundings
7	Barkly (Herchenroeder) BH 664	Coromandel & Beau Bassin	17	Schoenfeld BH 337	La Clemence & Riviere Du Rempart
8	Cottage (Poonith) BH 563A	Surroundings	18	Caroline BH44	Surrounding & Bel Air
9	Haute Rive BH 391	Riviere Du Rempart	19	Cluny No3 BH 217C	Riche En Eau
10	Barkly (Swimming Pool) BH 501	Surroundings			

- Sites experiencing severe drop in Dynamic Water Level are given below:-

Ser No	Site	Ser No	Site	Ser No	Site
1	Pierrefonds BH 712	8	Bassin Loulou Jamblon	15	L’Esperance Trebuchet
2	Beau Bois BH 76B	9	Camp La Boue BH SW26	16	Haute Rive BH391
3	Labourdonnais BH551	10	Morcellement St Andre BH117	17	Morcellement St Andre BH 309

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Ser No	Site	Ser No	Site	Ser No	Site
4	P D'Or No 1, 3 & 4 BH 123 (i, iii, & iv)	11	Riche Terre BH36	18	Laventure BH11A
5	Barkly (Hercheroeder) BH 664	12	Bassin BH 432	19	Bassin BH717
6	Holyrood - BH 35A, 35D & 35E	13	Holyrood BH 947	20	Palmyre BH 827
7	Valentina BH 733	14	Yemen BH 853		

3.6 Benefit Cost Analysis of a Variable Speed Drive v/s Auto Transformer Starter.

Ser No	Description	Auto Transformer Starter	Variable Speed Drive
1	Start of Submersible Pump	3 x Nominal Current	Ramp Start
2	Additional Equipment Required	Power Factor Corrector required as inductive components of starter leads to low Power Factor	Unity Power Factor at Input of VSD
3	Harmonic Distortion	Negligible	Expected to be high

3.7 Cost Analysis:

Ser No	VSD Capacity (kW)	Cost of VSD (Rs)	Cost of Autotransformer Starters C/W Power Factor Correctors (Rs)
1	15	60,000.00	68,000.00
2	30	97,000.00	97,000.00
3	45	105,000.00	110,000.00
4	55	165,000.00	130,000.00
5	92	220,000.00	170,000.00

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3.8 Sites to be operated with Variable Speed Drive:

As mentioned at para 1.11, direct operation of submersible pumps into the distribution mains using Variable Speed Drive will lead to energy savings. The energy savings will be derived from the following situations: -

- lower consumption and operation during the night
- Lower leakage while operation at lower speed during the night.

Based on the analysis of the night flow of these pumps, it is observed that certain sites record a flow reduction of the order of **10%** of the rated flow. However, this analysis has been incomplete due to technical restriction while installing water flow loggers on discharge pipe of the submersible pumps.

The exact analysis on the savings based on reduction of leakage has not been possible but it is estimated to be around a minimum of **10-15%** reduction in unaccounted water as per the **Non Revenue Water** Section of the CWA. The savings under this item is not included in this report but it shall be investigated by an onsite test.

- For this purpose, it is proposed to install a Variable Speed Drive unit of capacity **92 kW** using a feedback control based on the pressure on the distribution line at **Barkly BH 664**. This site has been chosen for trial test as it operates directly onto the distribution line and the level of non - revenue water is at 50% (rounded). For this site, it is also proposed to change the CEB meter, for an electronic meter with which, power monitoring will be easier.
- It is also recommended to install a submersible pump rated at **275 m³/hr x 75 m** (available in stock at CWA) and use the same variable speed drive that shall be installed at Barkly BH 664, for the test on the variation of production and power consumption during the year at Holyrood BH 35E. This test shall also require appropriate hydrological studies by the WRU.

The proposed monitoring sheets for the above two (2) tests are given at **Annex - 7** and **Annex – 8**.

CHAPTER 4

Recommendation

4.1 Introduction.

This chapter relates to a summary of findings observed at Chapter 2 and 3 regarding the calculation of the energy savings that can be realized.

4.2 Investment required for replacement of pumps

From the findings done at para 3.3, the estimated savings based on reduction of the annual electrical consumption is **Rs 3,656,284.26**, i.e. **1,617,972 kWh** for M&E (North) and **Rs 2,909,982.60** for M&E (South). The total savings amounts to **Rs 6,566,266.86**, i.e. **1,287,720 kWh** which is equivalent to **5.71%** of the Annual Electricity Budget (Rs 115M). This savings is envisaged based on the replacement of the oversized pumps as listed at para 3.3. The Central Water Authority has already engaged in the replacement of certain submersible pumps and the purchase is being done under the ongoing contract **C2006/26 – Supply of Submersible Pumps & Accessories**. Furthermore, it is also found that the available pumps within the CWA are not of appropriate capacity, and therefore it is required to purchase additional pumps. The required investment cost for the replacement of the required submersible pumps is listed hereunder: -

M&E (North)

Ser No	Site	BH No	Recommended Pump Capacity (m³/hr x m x kW)	Expected Investment Cost (Rs)
1	Beau Bois	825	40 x 100 x 18.5	150,000
2	Beau Bois	76B	15 x 80 x 7.5	55,000
3	St Martin	367B	120 x 50 x 26	130,000
4	Bois Manges	12	50 x 60 x 15	110,000
5	Haute Rive	391B	60 x 70 x 18.5	135,000
6	La Clemence	692	50 x 60 x 15	110,000
7	Morcellement St Andre	309A	45 x 40 x 7.5	60,000
8	Morcellement St Andre	309B	46 x 40 x 7.5	60,000
9	Esperance Trebuchet	537A	110 x 35 x 15	105,000
10	Fond Du Sac	No1	72 x 80 x 22	150,000
11	Fond Du Sac (Forbach)	743	260 x 70 x 70	300,000
12	Poudre D'Or	752	270 x 60 x 65	300,000
13	Poudre D'Or No1	123(i)	60 x 40 x 11	132,000

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Ser No	Site	BH No	Recommended Pump Capacity (m ³ /hr x m x kW)	Expected Investment Cost (Rs)
14	Poudre D'Or No3	123(iii)	120 x40 x 22	105,000
15	Poudre D'Or No4	123(iv)	180 x40 x 26	160,000
16	Petite Retraite	No1	210 x40 x 32	150,000
17	Petite Retraite	No2	210 x40 x 32	150,000
18	Laventure	11A	30 x 80 x 11	70,000
19	Mapou	558	65 x 85 x 22	105,000
20	Bonne Mere	492A	275 x 60 x 66	300,000
21	Bonne Mere	492B	275 x 60 x 66	300,000
Total Amount (Rs)				3,137,000

M&E (South)

Ser No	Site	BH No	Recommended Pump Capacity (m ³ /hr x m x kW)	Expected Investment Cost (Rs)
1	Cluny	217A	300 x 40 x 52	300,000
2		217B	300 x 40 x 52	300,000
3		217C	300 x 40 x 52	300,000
4	Gebert	667	150 x 60 x 37	150,000
5	Barkly	664	180 x 80 x 42	150,000
6	Ebene	477	55 x 70 x 13	110,000
7	Holyrood	826	300 x 34 x 45	210,000
8	Mon Desert	548A	30 x 30 x 5.5	55,000
9	Mon Tresor	548B	30 x 30 x 5.5	55,000
10	Eau Bonne	247B	160 x 90 x 56	150,000
11	Solferino Dookhun	359A	160 x 40 x 22	105,000
12	Telfair	521	60 x 100 x 22	105,000
13	Telfair	531	60 x 100 x 22	105,000
Total Amount (Rs)				2,095,000

The total investment cost for the purchase of submersible pumps is of the order of **Rs 5,232,000.00** This investment cost is of the order of **Rs 4,147,000** for replacement of oversized submersible pumps and **Rs 1,085,000** for replacement of inefficient submersible pumps.

4.3 Purchase of Variable Speed Drives

As a trial basis, only one site at Barkly (Herchenroeder) BH 664 is recommended for operation using a variable speed drive. The investment cost required is around **Rs 350,000** for the purchase of a 92 kW Variable Speed Drive, Pressure Transducer and surge protectors. Thereafter, additional shall be required for the purchase of Variable Speed Drives for other sites.

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4.31 Purchase of VSD for sites operating directly on the distribution mains.

Further to the test that shall be carried out at **Barkly (Herchenroeder) BH 664** as described at para 3.8 and the analysis for potential energy savings that can be envisaged, it shall be required to purchase Variable Speed Drives of the following capacities as detailed hereunder;

M&E (North)				M&E (South)			
Ser No	Site	VSD Capacity (kW)	Estimated Cost (Rs)	Ser No	Site	VSD Capacity (kW)	Estimated Cost (Rs)
1	Cottage (New) BH 564	45	115,000	1	Barkly Herchenroeder BH 664	75	200,000
2	Fond Du Sac (Choisy) BH 643	45	115,000	2	Barkly Swimming Pool BH 501	45	115,000
3	Mapou BH558	30	95,000	3	Choisy Baie Du Cap BH776	11	50,000
4	Camp Ithier BH815	45	115,000	4	Gebert BH 667	45	115,000
5	Cottage Poonith BH 563A	45	115,000	5	Cluny No3 BH 217C	56	170,000
6	La Clemence BH 692	15	60,000	-	-	-	-
7	Poudre D’Or No 2 BH 123(ii)	45	115,000	-	-	-	-
8	Solitude BH 748	30	95,000	-	-	-	-

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M&E (North)				M&E (South)			
Ser No	Site	VSD Capacity (kW)	Estimated Cost (Rs)	Ser No	Site	VSD Capacity (kW)	Estimated Cost (Rs)
9	Laventure	20	75,000	-	-	-	-
	BH 11A						
10	Mon Loisir	45	115,000	-	-	-	-
	BH720						
11	Schoenfeld	20	75,000	-	-	-	-
	BH337						
12	Caroline BH 44	70	180,000	-	-	-	-
Total Amount (Rs)			1,270,000	Total Amount (Rs)			650,000

The total cost for the purchase of VSD is of the order of **Rs 1,920,000**.

4.32 Purchase of VSD with associated accessories for sites experiencing severe drop in Dynamic Water Level

Further to the test to be carried out at Holyrood BH 35E, and the analysis of the results, it shall be required to purchase additional Variable Speed Drives and Oversized Submersible Pumps. The exact capacity of these equipments shall be determined based on the results that shall be obtained from the test. It is expected that the investment cost required for these 17 sites shall be around **Rs 2 Million**.

4.4 Investment Plan

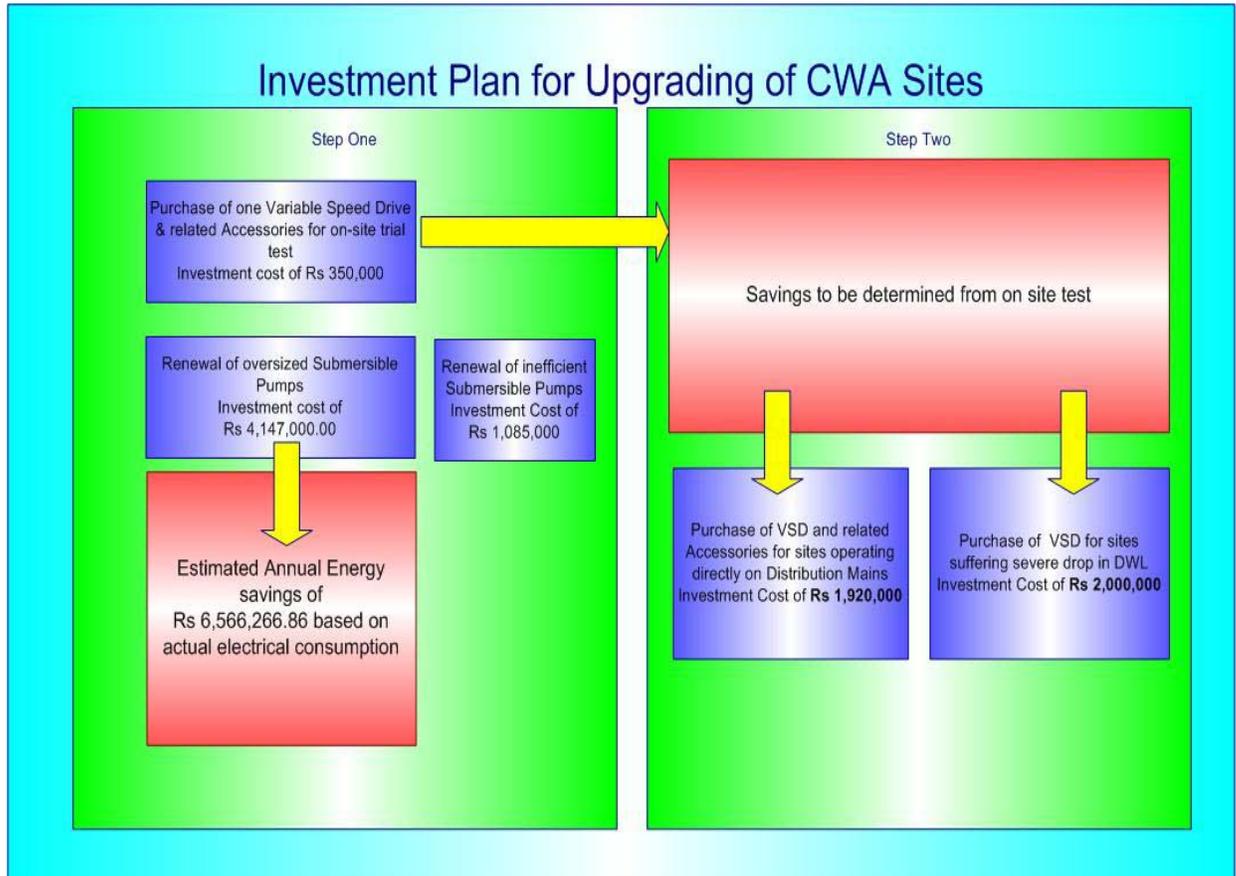
Based on the study in the previous chapters, it is found that the potential energy savings will be **Rs 6,566,266.86** Additional savings is possible and it will be quantified by an on site study and test. This investment is required to pursue the next phase of this project and shall involve the following:

- Implementation of recommendations of the previous phases of the project
- Purchase of recommended submersible pumps as given at **para4.2** and proceed with installation of same.
- Purchase of one (1) **92kW** Variable Speed Drive and accessories and installation for tests at Holyrood BH 35E and Barkly BH 664.

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- Calculate savings based on
 - reduction of electrical power during the night
 - reduction of non revenue water
- Calculate ratings of equipments that shall be required and investment plan for phase II

The investment plan that shall be required is given below:



Roughness size on the internal surface of pipes.

Pipe Material	Roughness Value
Ductile Iron and Cast Iron	0.3
Galvanized Iron	0.15
Steel and Asbestos cement	0.03
Smooth materials including PE pipes	0.003

Volume of Water produced (m³)

DWS-MAV LOWER														
80	Bambou (Eau Bonne) BH No1													
81	Bambou (Eau Bonne) BH No2	110,200.00	101,788.00	110,816.00	104,312.00	101,998.00	97,289.00	80,483.00	117,367.00	93,329.00	95,456.00	88,522.00	84,023.00	1,185,583.00
82	Barkly (BH)													
83	Barkly (SP)	161,932.00	148,448.00	180,772.00	182,964.00	189,076.00	175,117.00	142,608.00	206,805.00	167,326.00	164,918.00	152,218.00	151,821.00	2,024,005.00
84	Bassin BH No 1													
85	Bassin BH No2	256,652.00	184,800.00	204,600.00	198,000.00	204,600.00	198,000.00	204,600.00	204,600.00	198,000.00	204,600.00	198,000.00	204,600.00	2,461,052.00
86	Bassin 717													
87	Bassin 435	70,198.00	64,349.00	81,393.00	84,466.00	73,796.00	62,303.00	50,892.00	59,052.00	41,638.00	99,851.00	100,574.00	91,711.00	880,223.00
88	Chamarel BH	8,539.00	7,698.00	8,835.00	8,368.00	8,361.00	8,483.00	6,857.00	9,904.00	7,799.00	7,882.00	8,748.00	8,506.00	99,980.00
89	Clairfonds BH No.1													
90	Clairfonds BH No.2	64,257.00	71,037.00	95,469.00	100,775.00	39,397.00	28,143.00	31,321.00	99,106.00	87,315.00	98,365.00	86,368.00	75,685.00	877,238.00
91	Ebene BH No1													
92	Ebene BH No2	43,370.00	39,626.00	34,836.00	48,138.00	46,205.00	43,922.00	33,298.00	51,345.00	42,631.00	43,673.00	38,957.00	36,684.00	502,685.00
93	Highlands													
94	Highlands	26,350.00	20,748.00	25,110.00	26,970.00	30,039.00	31,440.00	24,738.00	34,193.00	29,910.00	34,689.00	30,720.00	35,464.00	350,371.00
95	Holyrood													
96	Holyrood													
97	Holyrood													
98	Holyrood													
99	Holyrood													
100	Holyrood													
101	Holyrood													
102	Holyrood													
103	Palma	52,380.00	49,036.00	54,335.00	31,852.00	-	-	53,543.00	53,000.00	52,344.00	53,977.00	51,819.00	55,790.00	508,076.00
104	Palmyre 26B	37,641.00	33,075.00	50,790.00	79,500.00	46,895.00	51,999.00	44,097.00	53,651.00	49,315.00	51,149.00	45,358.00	37,353.00	580,823.00
105	Palmyre 419	36,172.00	32,792.00	38,989.00	38,164.00	37,982.00	35,984.00	30,039.00	44,145.00	35,385.00	36,623.00	35,122.00	33,387.00	434,784.00
106	Palmyre (new) 827	23,291.00	21,228.00	28,566.00	30,222.00	29,543.00	27,519.00	22,769.00	31,975.00	25,185.00	26,173.00	24,792.00	23,011.00	314,274.00
107	Pont Fer (petit camp) BH No1													
108	Pont Fer (petit camp) BH No2	36,699.00	34,787.00	40,286.00	41,676.00	39,503.00	40,567.00	30,638.00	41,110.00	37,607.00	38,215.00	36,221.00	33,632.00	450,941.00
109	Solferino BH	32,479.00	31,884.00	40,638.00	62,634.00	35,008.00	34,499.00	28,360.00	42,535.00	18,136.00	34,247.00	33,346.00	32,073.00	425,839.00
110	Solferino Candos													
111	Solferino Candos	119,746.00	104,393.00	120,974.00	114,366.00	146,812.00	158,132.00	118,399.00	165,106.00	129,477.00	133,942.00	127,396.00	121,445.00	1,560,188.00
112	Solferino Dookun													
113	Solferino Dookun	92,435.00	77,812.00	58,175.00	45,114.00	51,150.00	86,643.00	71,417.00	109,083.00	88,755.00	115,145.00	61,785.00	68,438.00	925,952.00
114	St Jean	39,961.00	34,831.00	41,637.00	41,068.00	40,789.00	39,019.00	32,045.00	47,011.00	37,627.00	37,409.00	30,136.00	17,608.00	439,141.00
115	St Jean													
116	St Paul BH No1													
117	St Paul BH No2	62,557.00	38,071.00	46,435.00	64,873.00	84,681.00	101,104.00	74,375.00	53,712.00	65,390.00	85,361.00	80,894.00	68,488.00	825,941.00
118	Telfair													
119	Telfair	60,853.00	78,064.00	85,374.00	82,140.00	83,886.00	74,834.00	73,346.00	64,914.00	60,030.00	59,489.00	58,290.00	59,675.00	840,895.00
120	Trianon													
121	Trianon (New)	176,364.00	195,732.00	210,222.00	214,774.00	234,681.00	212,515.00	168,868.00	240,932.00	188,561.00	202,750.00	205,353.00	169,527.00	2,420,279.00
122	Valentina (Lower Phoenix)													
123	Valentina (Lower Phoenix)	83,247.00	81,723.00	110,902.00	103,374.00	102,340.00	83,732.00	70,816.00	102,926.00	84,843.00	87,346.00	79,818.00	75,326.00	1,066,393.00
124	Valentina (new)	21,596.00	18,681.00	22,793.00	31,696.00	36,165.00	33,340.00	22,695.00	32,265.00	30,051.00	28,876.00	24,111.00	19,635.00	321,904.00
125	Yemen													
126	Yemen(OLD)	103,304.00	97,932.00	30,345.00	111,528.00	115,943.00	109,814.00	77,264.00	150,533.00	109,940.00	113,188.00	111,068.00	109,206.00	1,240,065.00
127	Yemen New	35,031.00	55,300.00	63,430.00	78,129.00	66,900.00	70,410.00	57,690.00	88,950.00	69,920.00	85,500.00	81,580.00	77,630.00	830,470.00
		7,320,503.00	6,753,446.00	7,408,934.00	7,442,467.00	7,447,622.00	7,281,241.00	7,160,180.00	7,856,322.00	7,356,703.00	7,749,635.00	7,398,145.00	7,461,152.00	88,636,350.00

Volume of Water produced (m³)

DWS-MAV LOWER														
80	Bambou (Eau Bonne) BH No1	110,200.00	101,788.00	110,816.00	104,312.00	101,998.00	97,289.00	80,483.00	117,367.00	93,329.00	95,456.00	88,522.00	84,023.00	1,185,583.00
81	Bambou (Eau Bonne) BH No2													
82	Barkly (BH)	161,932.00	148,448.00	180,772.00	182,964.00	189,076.00	175,117.00	142,608.00	206,805.00	167,326.00	165,638.00	152,527.00	151,821.00	2,025,034.00
83	Barkly (SP)													
84	Bassin BH No 1	256,652.00	184,800.00	204,600.00	198,000.00	204,600.00	204,600.00	204,600.00	198,000.00	204,600.00	198,000.00	204,600.00	198,000.00	2,461,052.00
85	Bassin BH No2													
86	Bassin 717	70,198.00	64,349.00	81,393.00	84,466.00	73,796.00	62,303.00	50,892.00	59,052.00	41,638.00	99,851.00	100,574.00	91,711.00	880,223.00
87	Bassin 435													
88	Chamarel BH	8,539.00	7,698.00	8,835.00	8,368.00	8,361.00	8,483.00	6,857.00	9,904.00	7,799.00	7,882.00	8,748.00	8,506.00	99,980.00
89	Clairfonds BH No.1	64,257.00	71,037.00	95,469.00	100,775.00	39,397.00	28,143.00	31,321.00	99,106.00	87,315.00	98,365.00	86,368.00	75,685.00	877,238.00
90	Clairfonds BH No.2													
91	Ebene BH No1	43,370.00	39,626.00	34,836.00	48,138.00	46,205.00	43,922.00	33,298.00	51,345.00	42,631.00	43,673.00	38,957.00	36,684.00	502,685.00
92	Ebene BH No2													
93	Highlands	26,350.00	19,264.00	26,009.00	37,590.00	41,602.00	44,880.00	32,271.00	34,720.00	34,320.00	40,982.00	39,930.00	37,324.00	415,242.00
94	Highlands													
95	Holyrood													
96	Holyrood													
97	Holyrood													
98	Holyrood													
99	Holyrood													
100	Holyrood													
101	Holyrood													
102	Holyrood													
103	Palma	53,280.00	49,036.00	54,335.00	31,852.00	-	-	53,543.00	53,000.00	52,344.00	53,977.00	51,819.00	55,790.00	508,976.00
104	Palmyre 26B	37,641.00	33,075.00	50,790.00	79,500.00	46,895.00	51,999.00	44,097.00	63,561.00	49,315.00	51,149.00	45,358.00	37,353.00	590,733.00
105	Palmyre 419	36,172.00	32,792.00	38,989.00	38,164.00	37,982.00	35,984.00	30,039.00	44,145.00	35,385.00	36,623.00	35,122.00	33,387.00	434,784.00
106	Palmyre (new) 827	23,291.00	21,228.00	28,566.00	30,222.00	29,543.00	27,519.00	22,769.00	31,975.00	25,185.00	26,173.00	24,792.00	23,011.00	314,274.00
107	Pont Fer (petit camp) BH No1	36,699.00	34,787.00	40,286.00	41,676.00	39,503.00	40,567.00	30,638.00	41,110.00	37,607.00	38,215.00	36,221.00	33,632.00	450,941.00
108	Pont Fer (petit camp) BH No2													
109	Solferino BH	32,479.00	31,884.00	40,638.00	32,634.00	35,008.00	34,499.00	28,360.00	42,535.00	18,136.00	34,247.00	33,346.00	32,073.00	395,839.00
110	Solferino Candos	119,746.00	104,393.00	120,974.00	114,366.00	146,812.00	158,132.00	118,399.00	165,106.00	129,477.00	133,942.00	127,396.00	121,445.00	1,560,188.00
111	Solferino Candos													
112	Solferino Dookun	92,435.00	77,812.00	58,175.00	45,114.00	51,150.00	86,643.00	71,417.00	109,083.00	88,755.00	115,145.00	61,785.00	68,438.00	925,952.00
113	Solferino Dookun													
114	St Jean	39,961.00	34,831.00	41,637.00	41,068.00	40,789.00	39,019.00	32,045.00	47,011.00	38,267.00	37,409.00	30,136.00	17,608.00	439,781.00
115	St Jean													
116	St Paul BH No1	62,557.00	38,071.00	46,435.00	64,873.00	84,381.00	101,104.00	74,375.00	53,712.00	65,390.00	85,361.00	80,894.00	68,488.00	825,641.00
117	St Paul BH No2													
118	Telfair	60,853.00	64,596.00	82,987.00	80,970.00	82,925.00	74,160.00	77,593.00	62,837.00	60,150.00	53,971.00	51,600.00	49,011.00	801,653.00
119	Telfair													
120	Trianon	176,364.00	195,732.00	210,222.00	214,774.00	234,681.00	212,515.00	168,868.00	240,932.00	188,561.00	202,750.00	205,353.00	169,527.00	2,420,279.00
121	Trianon (New)													
122	Valentina (Lower Phoenix)	83,247.00	81,723.00	110,902.00	103,374.00	102,340.00	83,732.00	70,816.00	102,926.00	84,843.00	87,346.00	79,818.00	75,326.00	1,066,393.00
123	Valentina (Lower Phoenix)													
124	Valentina (new)	21,596.00	18,681.00	22,793.00	31,696.00	16,165.00	33,340.00	22,695.00	32,265.00	30,051.00	28,876.00	24,111.00	19,635.00	301,904.00
125	Yemen	103,304.00	97,932.00	30,345.00	11,528.00	115,943.00	109,814.00	77,264.00	150,533.00	109,940.00	113,188.00	111,068.00	109,206.00	1,140,065.00
126	Yemen(OLD)													
127	Yemen New	65,031.00	55,300.00	63,430.00	78,129.00	66,900.00	70,410.00	57,690.00	88,950.00	69,920.00	85,500.00	81,580.00	77,630.00	860,470.00
		8,345,688.00	7,195,449.00	8,041,936.00	8,655,660.00	7,975,582.00	8,031,657.00	8,063,233.00	8,894,823.00	8,216,486.00	8,541,989.00	8,306,905.00	8,208,378.00	98,477,786.00

-MAV LOWER		Active Electrical Cost (Rs)												
80	Bambou (Eau Bonne) BH No1	25,749.00	179,409.60	158,914.80	170,649.00	165,223.80	169,453.80	163,861.20	170,766.00	178,894.89	171,678.15	178,416.00	167,888.70	1,900,904.94
81	Bambou (Eau Bonne) BH No2													
82	Barkly (BH)	180,468.00	157,248.00	157,680.00	156,816.00	72,252.00	95,580.00	113,400.00	108,000.00	137,460.18	104,101.20	114,080.40	135,853.20	1,532,938.98
83	Barkly (SP)													
84	Bassin BH No 1	150,660.00	181,980.00	154,116.00	161,244.00	187,164.00	152,604.00	164,484.00	152,712.00	179,569.64	178,038.00	136,080.00	33,226.20	1,831,877.84
85	Bassin BH No2													
86	Bassin 717	127,881.00	94,032.00	91,560.60	97,507.80	94,003.20	96,303.60	93,009.60	96,622.20	101,378.61	98,924.49	134,611.47	174,248.55	1,300,083.12
87	Bassin 435													
88	Chamarel BH													-
89	Clairfonds BH No.1	38,052.00	39,600.00	40,356.00	54,792.00	67,032.00	42,732.00	45,072.00	44,352.00	41,713.70	43,810.20	39,387.60	42,865.20	539,764.70
90	Clairfonds BH No.2													
91	Ebene BH No1	18,072.00	19,800.00	15,048.00	15,300.00	12,096.00	15,840.00	18,936.00	15,156.00	18,295.82	13,003.20	13,305.60	17,879.40	192,732.02
92	Ebene BH No2													
93	Highlands	26,082.00	21,870.00	19,602.00	22,788.00	19,980.00	22,788.00	11,448.00	16,524.00	20,014.31	19,164.60	20,752.20	19,051.20	240,064.31
94	Highlands													
95	Holyrood	190,080.00	204,660.00	204,480.00	238,320.00	235,440.00	213,120.00	250,740.00	196,560.00	264,747.09	191,079.00	205,065.00	189,378.00	2,583,669.09
96	Holyrood													
97	Holyrood													
98	Holyrood													
99	Holyrood													
100	Holyrood													
101	Holyrood													
102	Holyrood													
103	Palma	24,577.20	25,297.20	23,122.80	14,504.40	7,916.40	7,407.00	10,935.00	10,668.60	24,305.81	25,123.77	25,953.48	25,480.98	225,292.64
104	Palmyre 26B	29,750.70	35,929.00	16,030.10	30,507.10	39,261.50	34,189.90	44,853.90	24,226.50	35,272.00	36,225.12	15,683.86	23,957.74	365,887.42
105	Palmyre 419													-
106	Palmyre (new) 827	48,732.00	57,226.00	47,182.00	55,862.00	62,248.00	53,630.00	59,458.00	53,506.00	62,068.84	56,332.80	49,226.00	46,422.40	651,894.04
107	Pont Fer (petit camp) BH No1	28,548.00	30,384.00	27,864.00	29,412.00	37,692.00	24,804.00	31,428.00	25,884.00	27,962.95	21,470.40	22,604.40	20,790.00	328,843.75
108	Pont Fer (petit camp) BH No2													
109	Solferino BH	28,416.60	28,625.40	27,081.00	27,896.40	27,880.20	25,182.00	35,404.20	35,875.80	25,260.68	20,608.56	21,254.94	20,574.54	324,060.32
110	Solferino Candos	18,414.00	18,414.00	13,608.00	15,282.00	21,870.00	10,260.00	14,472.00	12,042.00	19,438.30	20,752.20	21,942.90	19,788.30	206,283.70
111	Solferino Candos													
112	Solferino Dookun	61,344.00	62,640.00	53,928.00	62,280.00	59,976.00	54,360.00	64,944.00	50,688.00	70,846.77	63,957.60	66,074.40	60,555.60	731,594.37
113	Solferino Dookun													
114	St Jean	18,856.80	18,738.00	12,888.00	13,091.40	14,360.40	18,311.40	17,931.60	18,338.40	19,533.34	19,026.63	19,610.64	18,935.91	209,622.52
115	St Jean													-
116	St Paul BH No1	28,080.00	23,472.00	21,888.00	32,616.00	27,720.00	22,752.00	24,768.00	25,056.00	24,975.56	30,240.00	27,442.80	35,305.20	324,315.56
117	St Paul BH No2													
118	Telfair													-
119	Telfair													
120	Trianon	75,276.00	89,424.00	75,816.00	81,432.00	89,640.00	76,140.00	83,052.00	72,036.00	109,788.62	68,720.40	86,694.30	91,854.00	999,873.32
121	Trianon (New)													
122	Valentina (Lower Phoenix)	48,195.00	48,580.20	46,031.40	50,657.40	44,407.80	47,910.60	47,118.60	50,151.60	54,006.82	51,542.19	53,373.60	50,831.55	592,806.76
123	Valentina (Lower Phoenix)													-
124	Valentina (new)	28,476.00	34,344.00	26,964.00	35,532.00	30,060.00	33,948.00	23,436.00	29,232.00	36,748.80	32,772.60	34,927.20	31,676.40	378,117.00
125	Yemen	74,736.00	90,612.00	75,060.00	81,324.00	89,964.00	76,302.00	89,856.00	70,092.00	93,459.86	91,910.70	80,343.90	70,308.00	983,968.46
126	Yemen(OLD)													
127	Yemen New	108,990.00	119,385.00	83,853.00	102,879.00	106,470.00	84,042.00	104,202.00	88,263.00	132,595.74	128,876.00	119,277.00	109,509.60	1,288,342.34
		4,773,087.90	4,741,964.60	4,252,650.90	4,515,033.30	4,392,362.10	4,140,577.50	4,449,375.10	4,148,016.70	4,891,885.42	5,029,276.40	5,041,500.09	5,155,241.03	55,313,264.08

-MAV LOWER		Active Electrical Cost (Rs)												
80	Bambou (Eau Bonne) BH No1	171,636.57	171,710.28	159,272.19	179,166.33	173,906.46	179,916.66	173,615.40	179,829.72	179,015.13	171,889.83	175,036.68	169,442.28	2,084,437.53
81	Bambou (Eau Bonne) BH No2													
82	Barkly (BH)	133,358.40	132,791.40	127,688.40	149,121.00	133,471.80	130,750.20	143,790.96	127,575.00	149,688.00	130,523.40	131,544.00	157,285.80	1,647,588.36
83	Barkly (SP)													
84	Bassin BH No 1	66,906.00	123,039.00	117,482.40	134,492.40	121,111.20	114,647.40	128,482.20	113,173.20	119,750.40	125,193.60	141,863.40	168,512.40	1,474,653.60
85	Bassin BH No2													
86	Bassin 717	138,136.32	180,857.88	180,857.88		323,350.65	196,535.43	224,125.65	273,069.09	248,737.23	242,742.15	171,143.28	271,698.84	2,451,254.40
87	Bassin 435													
88	Chamarel BH													
89	Clairfonds BH No.1	37,081.63	35,418.60	36,136.80	47,817.00	53,033.40	62,407.80	59,232.60	52,239.60	47,703.60	52,088.40	62,131.43	49,555.80	594,846.66
90	Clairfonds BH No.2													
91	Ebene BH No1	18,937.80	18,333.00	18,257.40	21,054.60	17,652.60	18,370.80	21,659.40	15,422.40	22,046.53	18,514.44	18,801.72	18,523.89	227,574.58
92	Ebene BH No2													
93	Highlands	18,314.10	18,427.50	20,015.10	22,113.00	18,314.10	20,185.20	21,716.10	21,035.70	20,865.60	21,602.70	20,355.30	23,927.40	246,871.80
94	Highlands													
95	Holyrood													
96	Holyrood													
97	Holyrood													
98	Holyrood													
99	Holyrood	230,202.00	247,023.00	257,985.00	265,167.00	233,604.00	268,191.00	271,971.00	254,583.00	292,761.00	264,033.00	269,892.00	247,212.00	3,102,624.00
100	Holyrood													
101	Holyrood													
102	Holyrood													
103	Palma	25,375.14	26,571.51	23,940.63	26,112.24	25,507.44	26,403.30	25,668.09	26,686.80	26,671.68	25,823.07	26,677.35	25,728.57	311,165.82
104	Palmyre 26B	23,423.10	27,423.12	23,119.92	29,124.84	25,307.38	27,899.08	31,873.02	29,372.60	31,426.40	31,951.26	30,849.38		311,770.10
105	Palmyre 419													
106	Palmyre (new) 827	49,030.40	54,702.80	47,335.20	54,376.80	47,791.60	49,356.40	57,962.80	52,942.40	55,094.00	57,376.00	48,900.00		574,868.40
107	Pont Fer (petit camp) BH No1	19,580.40	20,412.00	23,549.40	22,528.80	20,071.80	20,676.60	22,566.60	22,642.20	19,618.20	23,133.60	20,941.20	22,264.20	257,985.00
108	Pont Fer (petit camp) BH No2													
109	Solferino BH	21,275.73	21,364.56	20,427.12	26,267.22	20,385.54	21,610.26	20,967.66	21,627.27	21,597.03	20,956.32	21,366.45	20,886.39	258,731.55
110	Solferino Candos	19,164.60	20,128.50	21,602.70	17,690.40	17,520.30	19,731.60	19,788.30	18,994.50	22,283.10	20,638.80	21,035.70	20,752.20	239,330.70
111	Solferino Candos													
112	Solferino Dookun	57,456.00	61,538.40	65,091.60	65,923.20	51,030.00	58,287.60	60,858.00	54,583.20	67,662.00	61,765.20	63,882.00	64,108.80	732,186.00
113	Solferino Dookun													
114	St Jean	17,905.86	19,022.85	17,369.10	18,943.47	17,835.93	19,327.14	18,848.97	19,614.42	19,599.30	18,733.68	19,540.71	22,084.65	228,826.08
115	St Jean													
116	St Paul BH No1	25,099.03	23,662.80	21,848.40	26,384.40	31,752.00	35,532.00	54,658.80	43,167.60	23,587.20	33,188.40	33,490.80	25,401.60	377,773.03
117	St Paul BH No2													
118	Telfair	48,705.30	55,169.10	51,143.40	57,040.20	63,277.20	60,272.10	65,998.80	56,586.60	61,803.00	55,849.50	65,545.20	68,266.80	709,657.20
119	Telfair													
120	Trianon	72,954.00	81,270.00	157,777.20	158,382.00	111,358.80	147,117.60	156,629.97	151,681.95	147,310.38	137,212.11	143,687.25	135,728.46	1,601,109.72
121	Trianon (New)													
122	Valentina (Lower Phoenix)	53,150.58	53,339.58	48,542.76	50,328.81	48,835.71	54,588.87	47,308.59	54,108.81	52,515.54	49,865.76	54,171.18	52,235.82	618,992.01
123	Valentina (Lower Phoenix)													
124	Valentina (new)	30,655.80	31,676.40	32,356.80	34,549.20	31,185.00	33,037.20	39,690.00	31,033.80	35,456.40	36,174.60	33,868.80	39,690.00	409,374.00
125	Yemen	86,977.80	84,709.80	81,931.50	97,694.10	81,874.80	84,879.90	96,390.00	87,998.40	93,895.20	88,055.10	82,328.40	98,147.70	1,064,882.70
126	Yemen(OLD)													
127	Yemen New	125,647.60	111,216.00	112,209.00	136,239.60	114,857.00	110,421.60	133,922.60	121,874.20	129,222.40	114,724.60	109,892.00	105,853.80	1,426,080.40
		5,262,966.66	5,708,730.47	5,151,220.86	5,398,641.75	5,345,070.46	5,256,952.01	5,930,563.80	5,574,423.86	5,730,279.49	5,640,508.34	5,642,069.82	5,747,031.30	64,251,844.06

Maximum Demand Charges (Rs)

S No	Site Name	2,004												Total 04
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
DWS- Port Louis														
1	Beau Bois BH	8,550	8,550	8,550	8,550	8,550	8,550	8,550	8,550	8,550	8,550	8,550	8,284	102,334
2	Beau Bois (New)													-
3	Beau Bois													-
4	Beau Songes	15,216	15,216	15,216	14,675	14,675	14,675	14,675	14,675	11,045	14,816	14,816	14,816	174,515
5	Beau Songes													-
6	Petite Riviere	5,244	5,244	5,244	5,187	5,187	5,187	5,073	4,902	4,902	4,902	4,845	4,845	60,762
7	Pierrefonds	10,221	10,221	10,221	9,985	9,985	9,985	9,959	9,913	4,549	5,514	10,612	10,612	111,776
8	St Martin													-
9	St Martin	5,130	5,130	5,130	5,130	5,130	5,130	5,130	5,757	5,757	5,757	5,757	12,825	71,763
DWS- NORTH														
10	B. Vue Mauricia	4,066	4,066	4,066	4,066	4,066	4,066	4,066	4,066	4,066	4,066	4,066	4,066	48,792
11	Bassin Loulou (Gallery)													-
12	Bassin loulou (Jamblon)	3,724	3,724	3,724	3,724	3,610	3,610	3,496	3,496	3,496	3,477	3,477	3,230	42,788
13	Bassin Loulou (Robinson)	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	22,800
14	Beau Plateau	4,560	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	40,090
15	Bois Mangués (Old P.de Papayes)	3,306	3,306	3,306	3,306	3,306	3,306	3,306	2,964	3,002	3,002	3,002	3,002	38,114
16	Camp La Boue	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	22,800
17	Camp Thorel	10,561	10,561	10,561	10,561	10,561	10,545	10,545	10,545	10,545	10,545	16,052	16,054	137,637
18	Cottage (New)	2,964	2,964	2,964	2,926	2,926	2,964	2,964	2,964	2,964	2,964	2,964	2,964	35,492
19	Cottage- Poonith	5,662	5,738	5,738	5,738	5,738	5,738	5,738	5,738	5,624	5,510	5,624	5,624	68,210
20	Esp.Trebuchet													-
21	F. Du Sac-Choisy													-
22	F. Du Sac-Choisy	9,073	9,101	9,130	9,538	9,538	9,538	9,538	9,538	9,538	9,538	9,215	9,215	112,499
23	F. Du Sac-forbach	8,949	8,949	8,835	8,892	9,120	9,120	9,120	9,120	9,120	9,120	9,120	9,120	108,585
24	Haute Rive	3,040	3,040	3,002	3,002	3,002	3,040	3,040	3,040	3,040	3,040	3,040	3,040	36,366
25	La Clemence	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	22,800
26	Labourdonnais	1,957	1,957	1,957	1,957	1,957	1,938	1,938	1,900	1,900	1,900	1,900	1,900	23,161
27	Mapou	2,214	2,214	2,214	2,214	2,214	2,214	2,214	2,206	2,549	2,576	2,659	2,660	28,151
28	Mon Loisir	5,155	5,155	5,155	4,711	4,711	4,711	4,711	4,748	4,748	4,748	4,748	4,748	58,492
29	MSA BH 117													-
30	MSA BH 117	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	2,318	2,318	2,318	2,318	24,472
31	MSA BH 306	7,714	7,714	7,572	7,572	7,524	7,192	7,192	7,192	7,192	7,192	7,192	7,192	88,436
32	MSA BH 309													-
33	MSA BH 309	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	22,800
34	P. Bon Espoir	14,805	14,871	14,880	15,003	15,129	15,129	15,129	15,129	15,129	15,129	15,129	15,217	180,678
35	P. D'Or (New)	10,260	10,260	10,260	10,203	10,203	10,203	10,203	10,203	10,260	10,260	10,260	10,260	122,835
36	P. D'Or No.1	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	22,800
37	P. D'Or No.2	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	22,800
38	P. D'Or No.3	3,382	3,335	3,335	3,297	3,297	3,297	3,297	3,297	3,297	3,297	3,297	3,297	39,720
39	P. D'Or No.4	3,648	3,639	3,639	3,620	3,620	3,610	3,610	3,620	3,620	3,620	3,620	3,620	43,482
40	Petite Retraite													-
41	Petite Retraite	5,700	5,814	5,814	5,814	5,814	5,814	5,814	5,814	5,814	5,814	5,814	5,700	69,540
42	Riche Terre	1,900	1,900	1,900	1,900	1,900	1,900	2,014	2,014	2,014	2,014	2,014	2,014	23,484
43	Schoenfeld													-
44	Schoenfeld	4,940	4,940	4,940	4,940	4,864	4,826	4,636	4,180	4,256	4,256	4,256	4,256	55,290
45	Solitude	3,762	3,990	3,990	3,990	3,990	3,990	3,990	3,990	3,990	3,990	3,990	3,762	47,424
DWS- EAST														
46	B.Rose Clemencia no1													-
47	B.Rose Clemencia no2		19,347	19,490	19,490	19,490	19,490	19,490	19,490	19,490	18,968	19,379	19,379	213,504
48	B.Rose Clemencia no3													-
49	Bel Etang	3,078	3,078	2,736	2,679	2,679	2,679	2,679	2,679	3,135	3,135	3,135	3,135	34,827
50	Bonne Mere													-
51	Bonne Mere	10,156	10,156	10,156	10,156	10,156	9,947	9,947	10,232	10,298	10,298	10,298	10,298	122,094
52	Camp Ithier	5,244	5,244	5,244	5,206	5,206	5,206	5,206	5,206	5,206	5,206	5,206	5,206	62,586
53	Caroline													-
54	Caroline	15,770	15,770	15,770	15,390	15,390	18,620	18,620	18,620	18,620	18,620	18,620	18,620	208,430
55	Constance BH No1													-
56	Constance BH No2	11,630	11,639	11,639	11,639	11,639	11,653	11,713	11,713	11,713	11,713	11,713	11,713	140,116
57	Laventure	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	22,800
58	Petit Paquet													-
DRY SEASON PUMPING STATIONS (N)														
59	Melrose BH													-
DWS SOUTH														
60	Choisy Baie du Cap New													-
61	Bananes	3,601	3,601	3,601	3,601	3,601	3,601	3,601	3,572	3,382	4,304	4,304	4,304	45,068
62	Café	1,900	1,900	1,900	2,242	2,242	2,242	2,242	2,242	2,242	2,242	1,900	1,900	25,194
63	Cluny													-
64	Cluny	33,440	33,250	33,250	32,680	32,680	32,870	33,820	33,820	34,200	34,200	34,200	34,200	402,610
65	Cluny													-
66	Gebert	6,308	6,308	6,308	6,308	6,308	6,308	12,920	12,920	12,920	12,920	-	38,912	128,440
67	M.D.M.T- Plaisance													-
68	M.D.M.T- Plaisance	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	22,800
69	N. France (new)	14,678	14,678	14,678	13,367	13,367	13,367	11,115	11,115	11,115	11,068	11,068	11,068	150,680
70	N. France(old)													-
71	Trois Boutiques													-
72	Trois Boutiques	7,676	7,676	7,676	7,600	7,676	7,676	7,676	7,676	7,752	7,752	7,752	7,752	92,340

Maximum Demand Charges (Rs)

MAV UPPER														-
73	Alma													-
74	Beard	14,820	14,820	14,820	10,716	10,716	10,602	10,374	6,885	8,369	8,369	8,369	8,369	127,227
75	Beard (new)													-
76	Bonne Veine BH no1													-
77	Bonne Veine BH no2													-
78	Montee du Fil	7,410	7,410	13,110	13,110	13,110	13,110	13,110	13,110	13,110	7,980	7,980	7,980	130,530
79	Montee du Fil													-
DWS-MAV LOWER														-
80	Bambou (Eau Bonne) BH No1	13,262	13,262	13,262	13,001	13,136	13,291	13,291	13,291	13,291	13,291	13,291	13,291	158,963
81	Bambou (Eau Bonne) BH No2													-
82	Barkly (BH)	17,670	17,442	17,442	17,442	17,442	15,846	14,250	14,250	14,250	14,250	14,250	9,234	180,006
83	Barkly (SP)													-
84	Bassin BH No 1	13,224	13,224	13,680	13,680	13,680	13,794	13,794	13,794	13,794	13,794	13,794	13,794	164,046
85	Bassin BH No2													-
86	Bassin 717	14,801	14,801	14,801	14,801	14,801	14,801	14,763	8,379	8,265	8,265	13,965	13,965	156,408
87	Bassin 435													-
88	Chamarel BH													-
89	Clairfonds BH No.1	6,460	6,460	3,952	6,802	6,840	6,840	6,840	6,840	6,840	6,840	6,840	6,650	78,204
90	Clairfonds BH No.2													-
91	Ebene BH No1	1,900	2,812	2,812	2,812	2,812	2,812	2,812	2,812	2,318	1,900	1,900	1,900	29,602
92	Ebene BH No2													-
93	Highlands	2,964	2,964	2,964	2,964	2,964	2,964	2,964	2,964	2,223	2,223	1,995	1,995	32,148
94	Highlands													-
95	Holyrood	18,810	19,190	19,190	19,190	22,800	22,800	22,800	22,800	22,800	22,800	24,890	24,890	262,960
96	Holyrood													-
97	Holyrood													-
98	Holyrood													-
99	Holyrood													-
100	Holyrood													-
101	Holyrood													-
102	Holyrood													-
103	Palma	1,911	1,941	1,941	1,941	1,941	1,941	1,941	1,941	1,910	1,910	1,910	1,911	23,140
104	Palmyre 26B													-
105	Palmyre 419													-
106	Palmyre (new) 827													-
107	Pont Fer (petit camp) BH No1	4,712	4,712	4,712	4,712	4,712	4,712	4,712	2,812	2,812	2,812	2,812	2,660	46,892
108	Pont Fer (petit camp) BH No2													-
109	Solferino BH	2,214	2,214	2,214	2,214	2,214	2,736	2,736	2,736	2,736	2,736	2,746	2,746	30,239
110	Solferino Candos	2,337	2,337	2,280	2,280	3,591	4,047	4,047	4,047	4,047	4,047	4,047	4,047	41,154
111	Solferino Candos													-
112	Solferino Dookun	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,712	58,216
113	Solferino Dookun													-
114	St Jean	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	22,800
115	St Jean													-
116	St Paul BH No1	4,256	4,256	4,256	5,396	5,396	5,396	5,396	5,396	5,396	5,396	4,560	4,560	59,660
117	St Paul BH No2													-
118	Telfair	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	6,954	86,583
119	Telfair													-
120	Trianon	6,726	6,669	6,669	6,669	6,669	6,669	6,669	6,669	6,669	6,669	6,669	11,552	84,968
121	Trianon (New)													-
122	Valentina (Lower Phoenix)	3,914	3,914	3,924	3,933	3,933	3,933	3,933	3,943	3,962	3,962	3,962	3,962	47,272
123	Valentina (Lower Phoenix)													-
124	Valentina (new)	2,622	2,698	2,736	2,736	2,736	2,812	2,812	2,812	2,812	2,812	2,812	2,812	33,212
125	Yemen	6,897	7,638	7,638	7,638	7,638	7,638	7,638	7,638	6,897	8,265	8,265	8,265	92,055
126	Yemen(OLD)													-
127	Yemen New	8,272	8,272	8,140	8,140	8,140	8,140	8,140	8,140	8,140	7,030	7,030	6,802	94,386
		483,137	503,055	506,105	503,252	508,093	508,997	510,580	498,685	490,679	490,372	484,647	536,248	6,023,850

Maximum Demand Charges (Rs)

MAV UPPER														-
73	Alma													-
74	Beard	8,369	8,369	8,369	6,684	7,614	7,614	7,614	7,614	7,614	7,614	7,614	6,697	91,786
75	Beard (new)													-
76	Bonne Veine BH no1													-
77	Bonne Veine BH no2													-
78	Montee du Fil	7,980	7,866	5,358	5,358	5,358	5,358	5,358	5,358	8,549	8,549	8,549	8,549	82,190
79	Montee du Fil													-
DWS-MAV LOWER														-
80	Bambou (Eau Bonne) BH No1	13,285	13,399	14,476	14,476	14,476	14,476	14,476	14,476	14,476	13,857	13,857	13,857	169,586
81	Bambou (Eau Bonne) BH No2													-
82	Barkly (BH)	25,650	25,650	25,650	25,650	25,650	25,650	25,650	10,488	10,488	10,488	10,488	10,488	231,990
83	Barkly (SP)													-
84	Bassin BH No 1	13,566	13,566	13,566	13,566	13,566	13,110	10,602	9,804	9,918	9,918	12,084	12,084	145,350
85	Bassin BH No2													-
86	Bassin 717	14,127	14,127	14,127	-	34,637	20,511	20,637	21,007	21,007	23,333	24,756	24,756	233,024
87	Bassin 435													-
88	Chamarel BH													-
89	Clairfonds BH No.1	6,650	6,650	6,156	5,928	6,650	6,650	6,650	6,650	6,650	6,650	10,737	10,737	86,758
90	Clairfonds BH No.2													-
91	Ebene BH No1	2,584	2,584	2,584	2,584	4,522	4,522	4,522	4,522	5,884	5,884	5,884	5,884	51,961
92	Ebene BH No2													-
93	Highlands	2,052	2,052	2,052	2,052	2,052	2,052	2,052	1,938	1,938	1,938	1,938	1,938	24,054
94	Highlands													-
95	Holyrood	24,890	24,890	24,890	24,890	24,890	23,750	23,750	23,750	23,750	25,080	25,080	25,080	294,690
96	Holyrood													-
97	Holyrood													-
98	Holyrood													-
99	Holyrood													-
100	Holyrood													-
101	Holyrood													-
102	Holyrood													-
103	Palma	1,934	1,934	1,965	1,965	1,965	1,965	1,965	1,965	1,965	1,918	1,918	1,918	23,375
104	Palmyre 26B													-
105	Palmyre 419											1,900	1,900	3,800
106	Palmyre (new) 827													-
107	Pont Fer (petit camp) BH No1	2,660	2,660	2,660	1,976	2,090	2,090	2,090	2,090	2,090	2,090	2,090	1,900	26,486
108	Pont Fer (petit camp) BH No2													-
109	Solferino BH	2,746	2,755	2,765	2,774	2,964	2,964	2,964	2,964	2,964	2,964	2,964	2,784	34,571
110	Solferino Candos	2,622	2,337	2,337	2,337	2,337	2,337	2,337	2,337	2,337	2,337	2,337	2,337	28,329
111	Solferino Candos													-
112	Solferino Dookun	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,712	4,712	4,712	4,712	4,712	57,608
113	Solferino Dookun													-
114	St Jean	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	2,708	23,608
115	St Jean													-
116	St Paul BH No1	4,560	4,560	4,560	4,560	4,940	4,940	4,940	4,940	4,940	4,940	4,940	4,104	56,924
117	St Paul BH No2													-
118	Telfair	6,954	6,441	6,441	6,384	6,441	6,441	6,441	6,441	6,669	6,669	6,669	6,669	78,660
119	Telfair													-
120	Trianon	11,552	11,552	11,552	11,552	11,552	11,552	12,170	12,170	12,170	12,170	12,170	12,170	142,335
121	Trianon (New)													-
122	Valentina (Lower Phoenix)	3,962	3,962	3,971	4,019	4,019	4,019	4,019	4,019	4,019	4,019	4,000	3,981	48,004
123	Valentina (Lower Phoenix)													-
124	Valentina (new)	2,774	2,622	2,622	2,622	2,812	2,812	2,812	2,812	2,812	2,812	2,812	2,812	33,136
125	Yemen	8,265	8,265	8,265	8,265	8,151	7,011	7,011	7,011	7,011	7,068	7,068	8,835	92,226
126	Yemen(OLD)													-
127	Yemen New	8,096	8,096	8,096	8,096	8,096	8,096	8,096	8,096	8,096	8,096	8,096	8,096	97,152
		537,704	568,000	571,426	555,152	594,884	556,061	596,684	545,547	553,521	549,990	574,580	563,705	6,767,255

Maximum Demand Charges (Rs)

MAV UPPER														-
73	Alma													-
74	Beard	14,820	14,820	14,820	10,716	10,716	10,602	10,374	6,885	8,369	8,369	8,369	8,369	127,227
75	Beard (new)													-
76	Bonne Veine BH no1													-
77	Bonne Veine BH no2													-
78	Montee du Fil	7,410	7,410	13,110	13,110	13,110	13,110	13,110	13,110	13,110	7,980	7,980	7,980	130,530
79	Montee du Fil													-
DWS-MAV LOWER														-
80	Bambou (Eau Bonne) BH No1	13,262	13,262	13,262	13,001	13,136	13,291	13,291	13,291	13,291	13,291	13,291	13,291	158,963
81	Bambou (Eau Bonne) BH No2													-
82	Barkly (BH)	17,670	17,442	17,442	17,442	17,442	15,846	14,250	14,250	14,250	14,250	14,250	9,234	180,006
83	Barkly (SP)													-
84	Bassin BH No 1	13,224	13,224	13,680	13,680	13,680	13,794	13,794	13,794	13,794	13,794	13,794	13,794	164,046
85	Bassin BH No2													-
86	Bassin 717	14,801	14,801	14,801	14,801	14,801	14,801	14,763	8,379	8,265	8,265	13,965	13,965	156,408
87	Bassin 435													-
88	Chamarel BH													-
89	Clairfonds BH No.1	6,460	6,460	3,952	6,802	6,840	6,840	6,840	6,840	6,840	6,840	6,840	6,650	78,204
90	Clairfonds BH No.2													-
91	Ebene BH No1	1,900	2,812	2,812	2,812	2,812	2,812	2,812	2,812	2,318	1,900	1,900	1,900	29,602
92	Ebene BH No2													-
93	Highlands	2,964	2,964	2,964	2,964	2,964	2,964	2,964	2,964	2,223	2,223	1,995	1,995	32,148
94	Highlands													-
95	Holyrood	18,810	19,190	19,190	19,190	22,800	22,800	22,800	22,800	22,800	22,800	24,890	24,890	262,960
96	Holyrood													-
97	Holyrood													-
98	Holyrood													-
99	Holyrood													-
100	Holyrood													-
101	Holyrood													-
102	Holyrood													-
103	Palma	1,911	1,941	1,941	1,941	1,941	1,941	1,941	1,941	1,910	1,910	1,910	1,911	23,140
104	Palmyre 26B													-
105	Palmyre 419													-
106	Palmyre (new) 827													-
107	Pont Fer (petit camp) BH No1	4,712	4,712	4,712	4,712	4,712	4,712	4,712	2,812	2,812	2,812	2,812	2,660	46,892
108	Pont Fer (petit camp) BH No2													-
109	Solferino BH	2,214	2,214	2,214	2,214	2,214	2,736	2,736	2,736	2,736	2,736	2,746	2,746	30,239
110	Solferino Candos	2,337	2,337	2,280	2,280	3,591	4,047	4,047	4,047	4,047	4,047	4,047	4,047	41,154
111	Solferino Candos													-
112	Solferino Dookun	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,712	58,216
113	Solferino Dookun													-
114	St Jean	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	22,800
115	St Jean													-
116	St Paul BH No1	4,256	4,256	4,256	5,396	5,396	5,396	5,396	5,396	5,396	5,396	4,560	4,560	59,660
117	St Paul BH No2													-
118	Telfair	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	7,239	6,954	86,583
119	Telfair													-
120	Trianon	6,726	6,669	6,669	6,669	6,669	6,669	6,669	6,669	6,669	6,669	6,669	11,552	84,968
121	Trianon (New)													-
122	Valentina (Lower Phoenix)	3,914	3,914	3,924	3,933	3,933	3,933	3,933	3,943	3,962	3,962	3,962	3,962	47,272
123	Valentina (Lower Phoenix)													-
124	Valentina (new)	2,622	2,698	2,736	2,736	2,736	2,812	2,812	2,812	2,812	2,812	2,812	2,812	33,212
125	Yemen	6,897	7,638	7,638	7,638	7,638	7,638	7,638	7,638	6,897	8,265	8,265	8,265	92,055
126	Yemen(OLD)													-
127	Yemen New	8,272	8,272	8,140	8,140	8,140	8,140	8,140	8,140	8,140	7,030	7,030	6,802	94,386
		483,137	503,055	506,105	503,252	508,093	508,997	510,580	498,685	490,679	490,372	484,647	536,248	6,023,850

Maximum Demand Charges (Rs)

MAV UPPER														-
73	Alma													-
74	Beard	8,369	8,369	8,369	6,684	7,614	7,614	7,614	7,614	7,614	7,614	7,614	6,697	91,786
75	Beard (new)													-
76	Bonne Veine BH no1													-
77	Bonne Veine BH no2													-
78	Montee du Fil	7,980	7,866	5,358	5,358	5,358	5,358	5,358	5,358	8,549	8,549	8,549	8,549	82,190
79	Montee du Fil													-
DWS-MAV LOWER														-
80	Bambou (Eau Bonne) BH No1	13,285	13,399	14,476	14,476	14,476	14,476	14,476	14,476	14,476	13,857	13,857	13,857	169,586
81	Bambou (Eau Bonne) BH No2													-
82	Barkly (BH)	25,650	25,650	25,650	25,650	25,650	25,650	25,650	10,488	10,488	10,488	10,488	10,488	231,990
83	Barkly (SP)													-
84	Bassin BH No 1	13,566	13,566	13,566	13,566	13,566	13,110	10,602	9,804	9,918	9,918	12,084	12,084	145,350
85	Bassin BH No2													-
86	Bassin 717	14,127	14,127	14,127	-	34,637	20,511	20,637	21,007	21,007	23,333	24,756	24,756	233,024
87	Bassin 435													-
88	Chamarel BH													-
89	Clairfonds BH No.1	6,650	6,650	6,156	5,928	6,650	6,650	6,650	6,650	6,650	6,650	10,737	10,737	86,758
90	Clairfonds BH No.2													-
91	Ebene BH No1	2,584	2,584	2,584	2,584	4,522	4,522	4,522	4,522	5,884	5,884	5,884	5,884	51,961
92	Ebene BH No2													-
93	Highlands	2,052	2,052	2,052	2,052	2,052	2,052	2,052	1,938	1,938	1,938	1,938	1,938	24,054
94	Highlands													-
95	Holyrood	24,890	24,890	24,890	24,890	24,890	23,750	23,750	23,750	23,750	25,080	25,080	25,080	294,690
96	Holyrood													-
97	Holyrood													-
98	Holyrood													-
99	Holyrood													-
100	Holyrood													-
101	Holyrood													-
102	Holyrood													-
103	Palma	1,934	1,934	1,965	1,965	1,965	1,965	1,965	1,965	1,965	1,918	1,918	1,918	23,375
104	Palmyre 26B													-
105	Palmyre 419											1,900	1,900	3,800
106	Palmyre (new) 827													-
107	Pont Fer (petit camp) BH No1	2,660	2,660	2,660	1,976	2,090	2,090	2,090	2,090	2,090	2,090	2,090	1,900	26,486
108	Pont Fer (petit camp) BH No2													-
109	Solferino BH	2,746	2,755	2,765	2,774	2,964	2,964	2,964	2,964	2,964	2,964	2,964	2,784	34,571
110	Solferino Candos	2,622	2,337	2,337	2,337	2,337	2,337	2,337	2,337	2,337	2,337	2,337	2,337	28,329
111	Solferino Candos													-
112	Solferino Dookun	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,712	4,712	4,712	4,712	4,712	57,608
113	Solferino Dookun													-
114	St Jean	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	2,708	23,608
115	St Jean													-
116	St Paul BH No1	4,560	4,560	4,560	4,560	4,940	4,940	4,940	4,940	4,940	4,940	4,940	4,104	56,924
117	St Paul BH No2													-
118	Telfair	6,954	6,441	6,441	6,384	6,441	6,441	6,441	6,441	6,669	6,669	6,669	6,669	78,660
119	Telfair													-
120	Trianon	11,552	11,552	11,552	11,552	11,552	11,552	12,170	12,170	12,170	12,170	12,170	12,170	142,335
121	Trianon (New)													-
122	Valentina (Lower Phoenix)	3,962	3,962	3,971	4,019	4,019	4,019	4,019	4,019	4,019	4,019	4,000	3,981	48,004
123	Valentina (Lower Phoenix)													-
124	Valentina (new)	2,774	2,622	2,622	2,622	2,812	2,812	2,812	2,812	2,812	2,812	2,812	2,812	33,136
125	Yemen	8,265	8,265	8,265	8,265	8,151	7,011	7,011	7,011	7,011	7,068	7,068	8,835	92,226
126	Yemen(OLD)													-
127	Yemen New	8,096	8,096	8,096	8,096	8,096	8,096	8,096	8,096	8,096	8,096	8,096	8,096	97,152
		537,704	568,000	571,426	555,152	594,884	556,061	596,684	545,547	553,521	549,990	574,580	563,705	6,767,255

Penalty charge for Excess kVA

DWS-MAV UPPER													-
73	Alma												-
74	Beard												-
75	Beard (new)												0
76	Bonne Veine BH no1												-
77	Bonne Veine BH no2												-
78	Montee du Fil			155	305			325	230				1,015
79	Montee du Fil												-
DWS-MAV LOWER													-
80	Bambou (Eau Bonne) BH No1	2,310											2,310
81	Bambou (Eau Bonne) BH No2												0
82	Barkly (BH)												0
83	Barkly (SP)												0
84	Bassin BH No 1											155	155
85	Bassin BH No2												-
86	Bassin 717	175	195	195	195						7,270		8,030
87	Bassin 435												-
88	Chamarel BH												-
89	Clairfonds BH No.1			45	160								205
90	Clairfonds BH No.2												-
91	Ebene BH No1												-
92	Ebene BH No2												-
93	Highlands												0
94	Highlands												-
95	Holyrood												-
96	Holyrood												-
97	Holyrood												-
98	Holyrood	285	450	225	265	230	115	360	740	770	730	985	5,155
99	Holyrood												-
100	Holyrood												-
101	Holyrood												-
102	Holyrood												-
103	Palma				20	55							75
104	Palmyre 26B												-
105	Palmyre 419												-
106	Palmyre (new) 827												-
107	Pont Fer (petit camp) BH No1												0
108	Pont Fer (petit camp) BH No2												-
109	Solferino BH												-
110	Solferino Candos							140					140
111	Solferino Candos												-
112	Solferino Dookun												-
113	Solferino Dookun												-
114	St Jean	140	260	185	180	95					60	165	1,085
115	St Jean												0
116	St Paul BH No1												-
117	St Paul BH No2												-
118	Telfair	1,325	1,540	1,500	1,490	1,480	1,425	1,340	1,055	1,095	1,015	1,000	15,280
119	Telfair												70
120	Trianon												70
121	Trianon (New)												-
122	Valentina (Lower Phoenix)												-
123	Valentina (Lower Phoenix)												-
124	Valentina (new)			50									50
125	Yemen												-
126	Yemen(OLD)												-
127	Yemen New												-
													9,850.00
													8,350.00
													8,935.00
													8,195.00
													9,305.00
													9,490.00
													7,915.00
													7,675.00
													10,050.00
													7,955.00
													15,860.00
													8,320.00
													111,900.00

S No	Site Name	2004												Total 04
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
VS- Port Louis														
1	Beau Bois BH													
2	Beau Bois (New)													
3	Beau Bois													
4	Beau Songes													
5	Beau Songes													
6	Petite Riviere													
7	Pierrefonds													
8	St Martin													
9	St Martin													
DWS- NORTH														
10	B. Vue Mauricia	0.69	0.76	0.61	0.72	0.74	0.71	0.73	0.67	0.72	0.83	0.74	0.71	0.72
11	Bassin Loulou (Gallery)													
12	Bassin loulou (Jamblon)	0.62	0.62	0.51	0.59	0.52	0.74	0.56	0.47	0.57	0.54	0.96	0.88	0.61
13	Bassin Loulou (Robinson)	1.10	1.16	3.25	#DIV/0!	2.39								
14	Beau Plateau	0.89	1.10	0.80	0.87	0.77	0.94	0.82	0.82	0.95	0.98	0.84	0.92	0.89
15	Bois Mangles (Old P.de Papayes)	0.72	0.83	0.70	0.78	0.78	0.75	0.80	0.72	0.75	0.86	0.78	0.75	0.77
16	Camp La Boue	0.76	1.07	0.97	1.01	0.87	0.83	0.86	0.82	0.89	0.82	0.83	1.05	0.89
17	Camp Thorel	0.87	1.08	1.06	1.17	1.12	1.14	1.10	1.13	1.21	1.12	1.29	1.71	1.16
18	Cottage (New)	2.39	2.74	2.43	2.46	2.70	2.59	2.57	2.33	2.76	0.93	0.83	0.87	1.73
19	Cottage- Poonith	0.82	0.95	0.93	0.97	0.94	0.86	0.86	0.85	1.07	1.01	0.90	0.98	0.92
20	Esp.Trebuchet													
21	F. Du Sac-Choisy													
22	F. Du Sac-Choisy	2.47	2.57	2.34	2.55	2.35	2.52	2.39	2.62	2.69	2.46	2.60	2.59	2.51
23	F. Du Sac-forbach	0.85	0.83	0.71	0.70	0.81	1.05	0.92	0.80	0.85	0.93	0.80	0.78	0.83
24	Haute Rive	0.84	1.02	0.81	0.88	0.82	0.96	0.80	0.79	0.98	1.27	0.96	0.85	0.91
25	La Clemence													
26	Labourdonnais	0.88	0.88	0.88	0.75	0.81	0.86	0.82	0.83	0.91	0.87	0.96	0.95	0.86
27	Mapou	0.65	1.45	1.18	1.30	1.21	1.34	1.22	1.20	1.36	1.16	1.18	1.16	1.20
28	Mon Loisir	1.22	1.30	1.02	1.09	0.96	1.21	1.06	1.12	1.23	1.17	1.23	1.19	1.14
29	MSA BH 117													
30	MSA BH 117	0.37	0.42	0.36	0.37	0.44	0.40	0.40	0.30	0.39	0.47	0.40	0.39	0.39
31	MSA BH 306	3.21	0.88	0.77	0.92	0.79	0.87	0.78	0.80	0.87	0.81	0.87	0.94	0.90
32	MSA BH 309													
33	MSA BH 309	0.07	0.67	0.47	#DIV/0!	0.04	0.27	0.44						
34	P. Bon Espoir	1.28	1.30	1.16	1.31	1.17	1.21	1.15	1.14	1.28	1.23	1.43	1.37	1.25
35	P. D'Or (New)	1.05	0.89	0.86	1.04	0.95	0.68	0.70	1.00	1.05	0.99	0.95	0.94	0.93
36	P. D'Or No.1	0.61	0.67	0.60	0.60	2.13	15.80	#DIV/0!	0.23	0.74	0.69	0.68	0.62	0.69
37	P. D'Or No.2	1.54	1.62	1.43	1.59	1.49	1.61	1.53	1.05	1.31	0.98	0.97	1.09	1.31
38	P. D'Or No.3	0.44	0.48	0.41	0.43	1.79	0.16	0.36	0.37	0.42	0.41	0.45	0.44	0.43
39	P. D'Or No.4	0.46	0.49	0.41	0.43	0.38	0.35	0.34	0.38	0.45	0.45	0.48	0.39	0.41
40	Petite Retraite													
41	Petite Retraite	0.82	1.08	0.88	0.96	0.77	0.93	0.78	0.75	0.91	1.04	0.97	0.89	0.90
42	Riche Terre	0.74	0.91	0.79	0.74	0.67	0.77	0.77	0.72	0.85	0.87	0.92	0.81	0.79
43	Schoenfeld													
44	Schoenfeld	0.78	0.67	0.55	0.62	0.55	0.63	0.47	0.51	0.61	0.72	0.65	0.58	0.60
45	Solitude	0.79	1.54	#DIV/0!	#DIV/0!	6.47	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.06	0.83	1.95
DWS- EAST														
46	B.Rose Clemencia no1													
47	B.Rose Clemencia no2	-	0.10	0.07	0.09	0.09	0.09	0.09	0.09	0.09	0.93	1.02	0.98	0.30
48	B.Rose Clemencia no3													
49	Bel Etang												0.22	3.83
50	Bonne Mere													
51	Bonne Mere	0.61	0.64	0.53	0.61	0.56	0.57	0.54	0.56	0.63	0.60	0.62	0.57	0.59
52	Camp Ithier	1.01	1.42	1.33	1.22	1.31	1.15	1.22	1.11	1.30	1.17	1.23	1.30	1.23
53	Caroline													
54	Caroline	0.75	0.67	0.62	0.69	0.67	0.65	0.63	0.68	0.76	0.65	0.72	0.71	0.68
55	Constance BH No1													
56	Constance BH No2	0.55	0.59	0.51	0.56	0.53	0.60	0.48	0.55	0.57	0.53	0.58	0.54	0.55
57	Laventure	1.95	1.39	1.16	1.28	1.24	1.28	1.22	1.22	1.16	1.32	1.29	1.33	1.30
58	Petit Paquet													
PUMPING STATIONS (N)														
59	Melrose BH													
DWS SOUTH														
60	Choisy Baie du Cap New	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
61	Bananes	0.49						0.19		0.05	0.52	0.58	0.49	0.58
62	Café	0.60	0.78	0.55	0.67	0.72	0.57	0.65	0.50	0.77	0.68	0.76	0.68	0.66
63	Cluny													
64	Cluny	0.57	0.58	0.58	0.55	0.59	0.50	0.59	0.47	0.61	0.65	0.60	0.54	0.57
65	Cluny													
66	Gebert	0.94	0.55	0.81	0.43	0.49	0.40	0.51	0.44	0.58	0.57	0.00	1.24	0.56
67	M.D.M.T- Plaisance													
68	M.D.M.T- Plaisance	0.59	0.73	0.74	0.74	0.66	0.77	0.69	0.68	0.71	0.72	0.73	0.78	0.71
69	N. France (new)	0.92	0.96	0.94	0.81	0.82	0.93	0.88	0.96	1.01	1.01	1.18	1.08	0.95
70	N. France(old)													#DIV/0!
71	Trois Boutiques													
72	Trois Boutiques	0.50	0.50	0.42	0.46	0.47	0.45	0.49	0.38	0.54	0.50	0.56	0.49	0.48

Electrical Production cost per m³ of Water

S No	Site Name	2004												Total 04
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
VS- Port Louis														
S-MAV UPPER														
73	Alma	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74	Beard	0.48	0.47	0.43	0.43	0.41	0.43	0.41	0.41	0.46	0.44	0.47	0.43	0.44
75	Beard (new)													
76	Bonne Veine BH no1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77	Bonne Veine BH no2													
78	Montee du Fil	0.36	0.37	0.38	0.42	0.37	0.35	0.54	0.51	0.52	0.46	0.44	0.40	0.43
79	Montee du Fil													
S-MAV LOWER														
80	Bambou (Eau Bonne) BH No1	0.37	1.89	1.55	1.76	1.75	1.88	2.20	1.57	2.06	1.94	2.17	2.16	1.74
81	Bambou (Eau Bonne) BH No2													
82	Barkly (BH)	1.22	1.18	0.97	0.95	0.47	0.64	0.90	0.59	0.91	0.72	0.81	0.96	0.85
83	Barkly (SP)													
84	Bassin BH No 1	0.64	1.06	0.82	0.88	0.98	0.84	0.87	0.81	0.98	0.94	0.76	0.23	0.81
85	Bassin BH No2													
86	Bassin 717	2.04	1.69	1.31	1.33	1.47	1.78	2.12	1.78	2.63	1.07	1.55	2.05	1.66
87	Bassin 435													
88	Chamarel BH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
89	Clairfonds BH No.1	0.69	0.65	0.46	0.61	1.88	1.76	1.66	0.52	0.56	0.51	0.54	0.65	0.70
90	Clairfonds BH No.2													
91	Ebene BH No1	0.46	0.57	0.51	0.38	0.32	0.42	0.65	0.35	0.48	0.34	0.39	0.54	0.44
92	Ebene BH No2													
93	Highlands	1.10	1.20	0.90	0.95	0.76	0.82	0.58	0.57	0.74	0.62	0.74	0.59	0.78
94	Highlands													
95	Holyrood	0.54	0.63	0.47	0.51	0.52	0.47	0.70	0.39	0.63	0.44	0.58	0.67	0.53
96	Holyrood													
97	Holyrood													
98	Holyrood													
99	Holyrood													
100	Holyrood													
101	Holyrood													
102	Holyrood													
103	Palma	0.51	0.56	0.46	0.52	#DIV/0!	#DIV/0!	0.24	0.24	0.50	0.50	0.54	0.49	0.49
104	Palmyre 26B	0.79	1.09	0.32	0.38	0.84	0.66	1.02	0.45	0.72	0.71	0.35	0.64	0.63
105	Palmyre 419	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
106	Palmyre (new) 827	2.09	2.70	1.65	1.85	2.11	1.95	2.61	1.67	2.46	2.15	1.99	2.02	2.07
107	Pont Fer (petit camp) BH No1	0.91	1.01	0.81	0.82	1.07	0.73	1.18	0.70	0.82	0.64	0.70	0.70	0.83
108	Pont Fer (petit camp) BH No2													
109	Solferino BH	0.94	0.97	0.72	0.48	0.86	0.81	1.34	0.91	1.54	0.68	0.72	0.73	0.83
110	Solferino Candos	0.17	0.20	0.13	0.15	0.17	0.09	0.16	0.10	0.18	0.19	0.20	0.20	0.16
111	Solferino Candos													
112	Solferino Dookun	0.72	0.87	1.01	1.49	1.27	0.68	0.98	0.51	0.85	0.60	1.15	0.95	0.85
113	Solferino Dookun													
114	St Jean	0.52	0.60	0.36	0.37	0.40	0.52	0.62	0.43	0.57	0.56	0.72	1.19	0.53
115	St Jean													
116	St Paul BH No1	0.52	0.73	0.56	0.59	0.39	0.28	0.41	0.57	0.46	0.42	0.40	0.58	0.46
117	St Paul BH No2													
118	Telfair	0.14	0.11	0.10	0.11	0.10	0.12	0.12	0.13	0.14	0.14	0.14	0.13	0.12
119	Telfair													
120	Trianon	0.46	0.49	0.39	0.41	0.41	0.39	0.53	0.33	0.62	0.37	0.45	0.61	0.45
121	Trianon (New)													
122	Valentina (Lower Phoenix)	0.63	0.64	0.45	0.53	0.47	0.62	0.72	0.53	0.68	0.64	0.72	0.73	0.60
123	Valentina (Lower Phoenix)													
124	Valentina (new)	1.44	1.98	1.31	1.21	0.91	1.10	1.16	0.99	1.32	1.23	1.57	1.76	1.28
125	Yemen	0.79	1.00	2.73	0.80	0.84	0.76	1.26	0.52	0.91	0.89	0.80	0.72	0.87
126	Yemen(OLD)													
127	Yemen New	3.35	2.31	1.45	1.42	1.71	1.31	1.95	1.08	2.01	1.59	1.55	1.50	1.66
		0.72	0.78	0.64	0.68	0.66	0.64	0.69	0.59	0.73	0.71	0.75	0.76	0.69

S No	Site Name	2005												Total 05
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
VS- Port Louis														
1	Beau Bois BH	0.16	0.18	0.17	0.18	0.15	0.16	0.16	0.18	0.18	0.17	0.18	0.18	0.17
2	Beau Bois (New)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Beau Bois	#DIV/0!												
4	Beau Songes	1.16	3.92	#DIV/0!	#DIV/0!	#DIV/0!	0.18	0.85	0.91	1.02	1.33	0.93	1.15	1.19
5	Beau Songes													
6	Petite Riviere	#DIV/0!												
7	Pierrefonds	1.03	1.98	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.38	0.95	0.18	0.17	0.37	1.04	1.10
8	St Martin	0.64	0.89	0.93	1.37	0.55	0.75	0.59	0.59	0.57	0.56	0.66	0.60	0.68
9	St Martin	#DIV/0!												
WVS- NORTH														
10	B. Vue Mauricia	0.72	0.89	0.68	0.66	0.75	0.73	0.76	0.60	0.75	0.67	0.64	0.90	0.72
11	Bassin Loulou (Gallery)													
12	Bassin loulou (Jamblon)	0.57	0.60	0.38	0.38	0.48	0.47	0.48	0.47	0.63	0.43	0.38	0.41	0.47
13	Bassin Loulou (Robinson)	#DIV/0!												
14	Beau Plateau	0.97	1.29	0.59	0.77	0.82	0.88	0.71	0.74	0.86	0.88	0.74	0.70	0.82
15	Bois Mangles (Old P.de Papayes)	0.76	0.94	0.74	0.72	0.81	0.75	0.83	0.77	0.79	0.85	0.77	0.79	0.79
16	Camp La Boue	1.25	1.31	1.53	1.50	1.69	1.62	0.59	2.23	1.38	1.12	1.24	1.44	1.31
17	Camp Thorel	1.32	1.50	1.22	1.25	1.38	1.52	1.32	1.41	1.40	1.30	1.54	1.48	1.38
18	Cottage (New)	0.81	1.11	0.88	0.91	0.75	0.92	0.88	0.76	0.81	0.87	0.87	0.84	0.85
19	Cottage- Poonith	0.00	2.09	0.80	0.83	0.92	1.05	0.94	0.83	0.93	0.92	0.87	0.76	0.90
20	Esp.Trebuchet													
21	F. Du Sac-Choisy	2.61	3.59	3.07	3.00	2.19	3.14	3.03	2.61	2.73	2.58	2.73	2.77	2.81
22	F. Du Sac-Choisy													
23	F. Du Sac-forbach	0.75	0.86	0.59	0.63	0.62	0.71	0.64	0.74	0.71	0.63	0.81	0.68	0.69
24	Haute Rive	0.00	1.94	0.87	1.11	0.86	1.05	0.94	0.96	1.43	1.01	0.95	1.46	1.02
25	La Clemence													
26	Labourdonnais	1.00	0.98	0.78	0.88	0.89	1.08	0.86	1.05	0.93	0.82	0.95	0.91	0.92
27	Mapou	1.26	1.04	0.99	1.06	1.04	1.15	1.11	1.11	1.19	1.13	1.18	1.13	1.12
28	Mon Loisir	1.30	1.49	1.06	1.11	1.10	1.17	0.77	1.12	1.20	1.15	1.23	1.23	1.14
29	MSA BH 117	0.40	0.50	0.42	0.34	0.36	0.40	0.32	0.30	0.35	0.39	0.38	0.39	0.38
30	MSA BH 117													
31	MSA BH 306	1.03	1.04	0.70	1.00	1.14	0.95	0.93	0.95	1.06	0.99	1.03	0.80	0.96
32	MSA BH 309	0.37	0.46	0.38	0.38	0.33	0.45	0.74	0.27	0.30	0.42	0.30	0.30	0.38
33	MSA BH 309													
34	P. Bon Espoir	1.41	1.45	1.16	1.18	1.21	1.31	1.31	1.37	1.45	1.36	1.48	1.56	1.34
35	P. D'Or (New)	1.08	0.94	0.84	1.07	0.94	0.82	1.04	1.00	1.16	0.83	0.94	1.20	0.99
36	P. D'Or No.1	0.76	1.05	0.69	0.50	0.69	0.54	0.54	#DIV/0!	0.16	0.47	0.66	0.72	0.66
37	P. D'Or No.2	1.15	1.39	1.00	0.97	1.37	#DIV/0!	1.62						
38	P. D'Or No.3	0.49	0.55	0.40	0.38	0.49	0.33	0.39	0.42	0.45	0.42	0.47	0.45	0.43
39	P. D'Or No.4	0.41	0.54	0.33	0.32	0.33	0.38	0.36	0.40	0.45	0.45	0.47	0.45	0.40
40	Petite Retraite	0.91	0.91	0.73	1.00	0.82	0.94	0.81	0.84	0.79	1.15	1.02	0.96	0.91
41	Petite Retraite													
42	Riche Terre	0.86	1.08	0.75	2.50	1.14	0.74	1.00	0.72	0.71	0.80	0.73	0.90	0.89
43	Schoenfeld	1.82	1.82	1.56	1.99	1.60	1.99	1.68	1.74	1.88	1.78	1.73	1.80	1.78
44	Schoenfeld													
45	Solitude	1.33	1.30	1.07	1.40	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.81	2.49	1.83
DWS- EAST														
46	B.Rose Clemencia no1	1.02	1.12	0.93	1.05	1.00	1.08	1.01	1.03	1.06	0.95	1.04	1.00	1.02
47	B.Rose Clemencia no2													
48	B.Rose Clemencia no3													
49	Bel Etang	0.95	0.61	0.95	0.46	0.94	1.31	0.83	0.48	0.98	1.09	0.70	1.30	0.83
50	Bonne Mere	0.59	0.67	0.75	0.43	0.43	0.78	0.76	0.46	0.63	0.56	0.63	0.21	0.57
51	Bonne Mere													
52	Camp Ithier	1.08	1.63	1.35	1.23	1.28	1.29	1.16	1.65	1.54	1.22	1.51	1.39	1.36
53	Caroline	0.73	0.77	0.66	0.73	0.76	0.73	0.74	0.75	0.76	0.78	0.81	0.80	0.75
54	Caroline													
55	Constance BH No1	0.65	0.87	0.90	1.07	0.87	0.94	0.88	0.90	1.00	0.96	1.24	1.27	0.96
56	Constance BH No2													
57	Laventure	1.33	1.53	1.41	2.58	1.73	2.52	1.53	1.46	1.47	1.39	1.32	1.24	1.57
58	Petit Paquet													
PUMPING STATIONS (N)														
59	Melrose BH													
DWS SOUTH														
60	Choisy Baie du Cap New	#DIV/0!												
61	Bananes	0.40	0.61	0.68	0.15	#DIV/0!	0.32	0.17	0.64	#DIV/0!	0.49	#DIV/0!	0.03	0.33
62	Café	0.69	0.74	0.25	0.73	0.56	0.00	1.37	0.67	0.69	0.64	0.67	0.64	0.64
63	Cluny	0.62	0.66	0.55	0.67	0.48	0.58	0.58	0.52	0.55	0.58	0.54	0.52	0.57
64	Cluny													
65	Cluny													
66	Gebert	0.65	0.71	0.54	0.59	0.47	0.57	0.52	0.51	0.57	0.53	0.61	0.61	0.57
67	M.D.M.T- Plaisance	0.78	0.92	0.71	0.75	0.73	0.74	0.73	0.75	0.78	0.74	0.77	0.79	0.76
68	M.D.M.T- Plaisance													
69	N. France (new)	0.97	1.25	0.87	0.96	0.81	0.00	1.68	0.83	0.87	0.80	0.94	0.93	0.90
70	N. France(old)	#DIV/0!												
71	Trois Boutiques	0.45	0.52	0.45	0.52	0.41	0.00	0.96	0.45	0.47	0.45	0.48	0.47	0.47
72	Trois Boutiques													

S No	Site Name	2005												Total 05
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
VS- Port Louis														
S-MAV UPPER														
73	Alma	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74	Beard	0.45	0.48	0.37	0.41	0.43	0.44	0.43	0.43	0.49	0.42	0.45	0.44	0.44
75	Beard (new)													
76	Bonne Veine BH no1	0.44	0.43	0.13	0.44	0.36	0.00	0.78	0.34	0.33	0.34	0.33	0.31	0.35
77	Bonne Veine BH no2													
78	Montee du Fil	0.46	0.44	0.25	0.38	0.37	0.37	0.39	0.34	0.30	0.40	0.43	0.43	0.38
79	Montee du Fil													
S-MAV LOWER														
80	Bambou (Eau Bonne) BH No1	1.68	1.82	1.57	1.86	1.85	2.00	2.34	1.66	2.07	1.95	2.13	2.18	1.90
81	Bambou (Eau Bonne) BH No2													
82	Barkly (BH)	0.98	1.07	0.85	0.96	0.84	0.89	1.19	0.67	0.96	0.85	0.93	1.11	0.93
83	Barkly (SP)													
84	Bassin BH No 1	0.31	0.74	0.64	0.75	0.66	0.62	0.68	0.62	0.63	0.68	0.75	0.91	0.66
85	Bassin BH No2													
86	Bassin 717	2.17	3.03	2.40	0.00	4.85	3.48	4.81	4.98	6.48	2.66	1.95	3.24	3.05
87	Bassin 435													
88	Chamarel BH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
89	Clairfonds BH No.1	0.68	0.59	0.44	0.53	1.51	2.45	2.10	0.59	0.62	0.60	0.84	0.80	0.78
90	Clairfonds BH No.2													
91	Ebene BH No1	0.50	0.53	0.60	0.49	0.48	0.52	0.79	0.39	0.66	0.56	0.63	0.67	0.56
92	Ebene BH No2													
93	Highlands	0.77	1.06	0.85	0.64	0.49	0.50	0.74	0.66	0.66	0.57	0.56	0.69	0.65
94	Highlands													
95	Holyrood													
96	Holyrood													
97	Holyrood													
98	Holyrood	0.66	0.77	0.59	0.58	0.52	0.59	0.76	0.50	0.69	0.59	0.75	0.85	0.64
99	Holyrood													
100	Holyrood													
101	Holyrood													
102	Holyrood													
103	Palma	0.51	0.58	0.48	0.88	#DIV/0!	#DIV/0!	0.52	0.54	0.55	0.51	0.55	0.50	0.66
104	Palmyre 26B	0.62	0.83	0.46	0.37	0.54	0.54	0.72	0.46	0.64	0.62	0.68	0.00	0.53
105	Palmyre 419	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.06	0.01
106	Palmyre (new) 827	2.11	2.58	1.66	1.80	1.62	1.79	2.55	1.66	2.19	2.19	1.97	0.00	1.83
107	Pont Fer (petit camp) BH No1	0.61	0.66	0.65	0.59	0.56	0.56	0.80	0.60	0.58	0.66	0.64	0.72	0.63
108	Pont Fer (petit camp) BH No2													
109	Solferino BH	0.74	0.76	0.57	0.89	0.67	0.71	0.85	0.58	1.36	0.70	0.73	0.74	0.74
110	Solferino Candos	0.18	0.22	0.20	0.18	0.14	0.14	0.19	0.13	0.19	0.17	0.18	0.19	0.17
111	Solferino Candos													
112	Solferino Dookun	0.67	0.85	1.20	1.57	1.09	0.73	0.92	0.54	0.82	0.58	1.11	1.01	0.85
113	Solferino Dookun													
114	St Jean	0.50	0.60	0.46	0.51	0.48	0.54	0.65	0.46	0.56	0.55	0.71	1.41	0.57
115	St Jean													
116	St Paul BH No1	0.47	0.74	0.57	0.48	0.43	0.40	0.80	0.90	0.44	0.45	0.48	0.43	0.53
117	St Paul BH No2													
118	Telfair	0.93	0.96	0.71	0.80	0.85	0.91	0.94	1.02	1.15	1.18	1.41	1.54	1.00
119	Telfair													
120	Trianon	0.48	0.47	0.81	0.79	0.52	0.75	1.00	0.68	0.85	0.74	0.76	0.87	0.72
121	Trianon (New)													
122	Valentina (Lower Phoenix)	0.69	0.70	0.47	0.53	0.52	0.70	0.72	0.56	0.67	0.62	0.73	0.75	0.63
123	Valentina (Lower Phoenix)													
124	Valentina (new)	1.55	1.84	1.53	1.17	2.10	1.08	1.87	1.05	1.27	1.35	1.52	2.16	1.47
125	Yemen	0.92	0.95	2.97	9.19	0.78	0.84	1.34	0.63	0.92	0.84	0.80	0.98	1.01
126	Yemen(OLD)													
127	Yemen New	2.06	2.16	1.90	1.85	1.84	1.68	2.46	1.46	1.96	1.44	1.45	1.47	1.77
		0.70	0.87	0.71	0.69	0.75	0.72	0.81	0.69	0.77	0.73	0.75	0.77	0.72

