

**INVESTIGATIONS ON THE EXTRACTION OF GROUNDWATER  
BY M/s HINDUSTAN COCA-COLA BEVERAGES  
PRIVATE LIMITED AT PLACHIMADA**

**Interim Report**

*Filed before*  
**THE HONOURABLE HIGH COURT OF KERALA**

*Prepared by*  
**The Investigation Team**

**Constituted vide Order WA/2125/2003, dated 19.12.2003  
by the Honourable High Court of Kerala**

11 May 2004

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**EXECUTIVE SUMMARY**

The Honourable high Court of Kerala has directed the Centre for Water Resources Development and Management (CWRDM), Vide Order No. WA/2125/03 dated 19<sup>th</sup> December 2003, to conduct a scientific investigation into the allegation that the works of M/s Hindustan Coca-Cola beverages Private Limited at Moolathara village in Chittur Taluk has resulted in shortage and scarcity of drinking water in neighbouring areas. The Honourable High Court in the above order had also directed the Executive Director, CWRDM, to prepare and file a project proposal with the above objectives before the Court. The study has envisaged a scientific investigation on the ground water potential of the area and the shortage and scarcity of drinking water in the nearby areas due to the current level of groundwater extraction by the Coca-Cola factory. The duration of the project is for a period of one year. The Interim Report has been prepared based on the analysis of all available information pertaining to the study area and also additional data generated under the present study during the three months period from the start of the project.

Groundwater forms the main source of water in Chittur Block, and recharge to groundwater is predominantly from rainfall. The rainguage in Chitturpuzha is in the Chittur Block of Palakkad District within which the Coca-Cola factory under consideration is also located. The rainfall data recorded at this rain gauge station shows the monsoon season (June to November) rainfall in both 2002 and 2003 has been much less than the mean value with the deviation from the mean as a percentage of the mean being lower than even –30 per cent. This deficiency in the rainfall, and that too in two successive years can be considered to be the most significant factor that has contributed to the acute scarcity of water experienced in Chittur Block. The unregulated withdrawal of ground water from the wells within the Coca-Cola factory complex and also outside even during such a water deficit period had aggravated the water scarcity situation further.

The available annual groundwater resources in Chittur Block has been assessed by the Central Ground Water Board as 66.7 million cubic meters (MCM) on the basis of groundwater assessment guidelines approved by the Ministry of Water Resources, Government of India. This estimate of available groundwater applies for mean rainfall conditions. Domestic water supply forms the most important use of water in any area. Irrigation water supply is also crucially important in Chittur Block since agriculture forms the main economic activity there. The committed annual groundwater draft that needs to be reserved to meet the water requirements of both domestic and irrigation sectors in Chittur Block till 2025 AD can be very safely estimated as 62.5 MCM. This leaves an annual balance of about 4.2 MCM of groundwater resources for meeting other

uses of water of which the requirement by Coca-Cola factory can be estimated as 0.1825 MCM (at the average rate of 5 lakh litres per day) which forms a little less than 5 per cent less than 5 per cent of 4.2 MCM. Hence, it can be very safely concluded that under normal rainfall conditions the planned groundwater withdrawal of 5 lakh litres per day by Coca-Cola factory will not adversely affect the availability of groundwater in and around the factory complex. However, groundwater withdrawal by Coca-Cola factory has been strictly controlled in those years in which the rainfall is much less than the mean value.

A realistic scheme of such a control regulation can be as follows. The rain gauge at Chitturpuzha maintained by CERDM can be considered as the reference rain gauge. A hydrologic year in Kerala can be very conveniently considered to comprise of 12 calendar months between June of one calendar year and May of the next one. The monsoon season rainfall between June and November can be taken as the basis to decide the restrictions to be imposed on the groundwater withdrawal by Coca-Cola factory during the non-monsoon season between December and May. Let the deviation of the monsoon season rainfall in a given year from the mean as a percentage of the mean be 'X'. The restrictions to be imposed can apply for a practical set of ranges of 'X' values. For each such range, the period of restrictions can be uniformly between 1<sup>st</sup> of February and 15<sup>th</sup> of June. If 'X' is less than -30 per cent, ground water withdrawal can be fully stopped. If 'X' is between -20 and -30 per cent, ground water withdrawal can be limited to 3.0 lakh litres per day. If 'X' is between 0 and -10 per cent, the groundwater withdrawal can be limited to 4 lakh litres per day. If 'X' is greater than or equal to zero per cent, the groundwater withdrawal can be the full required 5.0 lakh litres per day.

The above recommendations are very practical from the point of view of convenience of implementation. The recommendation will also protect the interests of domestic and irrigation water supply sectors adequately well, and will also ensure that the developmental opportunities which industrial establishments can create in an area that is otherwise predominantly agrarian are fully utilised. The recommendations that have been made above are however tentative and have scope to be refined and improved during the remaining period of the project.

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**1.0 BACKGROUND**

M/s Hindustan Coca-Cola beverage Private Limited is located at Plachimada in Moolathara village of Perumatti Grama Panchayat in Chittur taluk of Palakkad District. Location map of the factory is shown in Figure 1. M/s Hindustan Coca-Cola Company, established in March 2000 is producing aerated carbonated non-alcoholic beverages. Their campus at Plachimada has an areal extent of about 35 acres (14 hectares) within which ground water is extracted through 6 bore wells and 2 dug wells. The location map of the water extraction and conservation structures within the premises of Coca-Cola Company is shown in Figure 2.

The study area receives an average annual rainfall of about 1412 mm (Chitturpuzha rainguage, 1993 to 2003). This area shown generally an undulating topography and is drained by the Chitturpuzha, a major tributary of Bharathapuzha. The major lithological units occurring in the Perumatty grama Panchayat are Migmatites, Khondalites, Charnockites, Gnesis and Aplites/Pegmatites. All these formations are embedded in a migmatite matrix. The main branch of the Moolathara Canal from Kambalathara Dam runs close to the northern boundary of the Coca-Cola campus. Agriculture is the main occupation of the people of the area.

As per the information given by the Company, about 5.0 lakh litres of groundwater is pumped out daily from all the wells put together. There are grievances from several quarters that the extraction of groundwater every day by the Company has created water shortage and scarcity problem of groundwater in the surrounding area. So far, no detailed scientific study has been carried out to understand the extent and severity of this problem. The Honourable High Court of Kerala has directed the Centre for Water Resources Development and Management (CWRDM) to conduct a scientific investigation into the allegation that the works of M/s Hindustan Coca-Cola factory at Moolathara village has resulted in shortage and scarcity of drinking water in the neighbouring areas. The Executive Director, CWRDM, is the Convenor and Coordinator of the investigation team. As per the directions of the Honourable High Court, the investigating team is comprised of one Expert Member each from the State Pollution Control Board, State Groundwater Department, and M/s Hindustan Coca-Cola Company. The Executive Director, CWRDM from within that organisation, has nominated seven Expert Members.

The duration of the project is for a period of one year. A monitoring phase will also be carried out for another two years.

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Interim Report prepared by the Investigation Team constituted vide Order WA/2125/2003 dated 19.12.2003 of the Honourable high Court of Kerala

## **2.0 OBJECTIVE**

Conducting an investigation in the light of the apprehension that the working of the factory of M/s Hindustan Coca-Cola Beverages Private Limited in Moolathara village of Chittur taluk has resulted in shortage/scarcity of drinking water in the neighbouring areas due to the over-exploitation of groundwater for the use of the factory.

### **2.1 Short-term Objectives**

All available data on rainfall, water fluctuations, groundwater extraction, discharge in streams and canals, block level estimation of groundwater potential etc will be analysed and an inference will be made whether the current level of extraction by the Coca-Cola Company can result in affecting the availability of water in the nearby areas. Based on this inference, a recommendation on what can be a sustainable level of groundwater extraction, which can be permitted to the Coca-Cola factory, will be made as an interim measure.

### **2.2 Long-term Objectives**

All relevant hydrologic and hydrologic data will be collected and analysed to re-confirm the interim recommendation or modify the same suitably. This forms the detailed investigation phase of the project.

A monitoring phase of at least two years duration will also be carried out as part of the project activities.

## **3.0 INSTITUTIONS INVOLVED**

As per the directions of the Honourable high Court, the investigating team comprises of Expert Members nominated from the following institutions:

- (1) Centre for Water Resources Development and Management (CWRDM),  
Kozhikode
- (2) State Groundwater Department
- (3) State Pollution Control Board
- (4) M/s Hindustan Coca-Cola beverages Private Limited

The Executive Director, CWRDM, is the Convenor and Co-ordinator of the investigating team, as directed by the Honourable high Court.

## **4.0 SUMMARY OF WORK CARRIED OUT**

The member of the investigating team met 5 times during January to May 2004 and discussed in detail the various aspects related to the project. Minutes of these meetings are enclosed as Appendix I (A to E). Based on the decisions taken in these meetings different hydrological aspects have been studied.

1. All the available reports on the ground water condition in the Palakkad District in general and the Chittur Block in particular, prepared by Central

Ground Water Board (CGWB), State Ground Water Department (SGWD) and M/s Coca-Cola were collected and analysed.

2. All the available data on the groundwater level fluctuation, rainfall, canal flow etc were collected from CGWB, SGWD, CWRDM, Water Resources Department and Indian Meteorological Department (IMD).
3. Weekly groundwater level fluctuation was monitored in some of the existing open wells and borewells, in and around the Coca-Cola factory, under this project during January to April 2004 to understand the effect of groundwater pumping by the factory on the surrounding wells. Details of weekly monitoring of depth to groundwater level in some of the existing open wells and borewells in and around the Coca-Cola factory is given in (Appendix-IIC). As some of these wells are fitted with pumps, if the water levels are measured in such wells just after the pumping is stopped, then the values will be incorrect and leads to wrong conclusions. Hence, only those wells, which are not fitted with pumps and borewells fitted with hand pumps, have been considered for the analysis of the groundwater level trend. It is noticed that the depth of water level falls from January to April end. The pumping of groundwater was stopped in the factory during mid March 2004 but the trend of water level falling in the observation wells and the factory area can be seen continued. No particular trend in groundwater level due to pumping from Coca-Cola could be established from these short-term observations.
4. The factory has 6 bore wells and 2 large diameter open wells. All these wells are fitted with water meters. As part of this study, weekly monitoring of water meter readings of these wells were carried out by the staff of CWRDM, in the presence of representatives from Perumattya Grama Panchayat and Coca-Cola Factory. According to this, the daily total groundwater withdrawal, from all the 6 borewells and 2 open wells vary from 2.75 to 5.04 lakh litres per day during January and March, 2004 (Appendix III). On an average 60% of groundwater is withdrawn from 2 open wells and 40% from 6 borewells. The Kerala State Government banned the Company from withdrawing groundwater from the 2<sup>nd</sup> week of March 2004, till the 2<sup>nd</sup> week of June 2004, due to severe drought condition.
5. Calibration of the water meter reading was done by checking the actual quantity of water pumped with respect to the reading shown by the water meter. The meter is found to be working satisfactorily.
6. A hundred per cent well census was carried out within an area of 1 km radius around the Coca-Cola factory, to know the details of existing wells such as numbers of open wells and borewells, purposes of usage, pumping details etc. The analysis of this data is in progress.

As an interim measure, the available results of groundwater resources in Chittur Block within which Coca-Cola factory situated is made use of to evaluate the scope of groundwater withdrawal from Coca-Cola factory and the results from the same are given in the next section.

## 5.0 INTERIM RECOMMENDATIONS

The Central Water Board (CGWB, 2003), has estimated the block level groundwater potential for all the 151 blocks in Kerala State, as per the approved guidelines of the Ministry of Water Resources, Government of India. The Perumatty Grama Panchayat, within which the Coca-Cola Factory is located, falls within the Chittur Block in Palakkad District. The results of groundwater potential in the Chittur block as given in the 2003 report of the CGWB are presented in Table-1. It can be seen that the total annual available groundwater resources in the Chittur Block is 66.7 MCM. Estimates of the annual groundwater draft, that is to be reserved unto 2025 AD for combined domestic and industrial water supply and the balance, that is left for meeting irrigation water supply have also been presented in Table-1. These estimates have been arrived at assuming that domestic and industrial water supply is given a higher priority. However, agriculture is the predominant activity in the study area. It may be therefore, more appropriate to first reserve a certain amount of groundwater resources to meet domestic and agricultural water supply. The balance can be then allocated to other uses like that for Coca-Cola factory. The latest National and State level water policies also give prominence to meeting domestic and irrigation water supply.

Data on area and population that are required to estimate the groundwater resources that is to be reserved for domestic and irrigation water supply are given in Table-1. Very conservative and reasonably valid assumptions have also been made to compute the committed groundwater resources to be reserved to meet domestic and irrigation water supply till 2025 AD. These results show that the balance groundwater resources available for use other than irrigation and domestic water supply in the whole of Chittur block is about 4.2 MCM.

As the groundwater recharge is more or less evenly distributed over the whole Chittur block, the balance of 4.2 MCM cannot be withdrawn from single location, but has to be reasonably well distributed over the full area. As a first approximation, it is probably realistic to limit the withdrawal from a single location in the block to about 5 % of the balance amount or 0.21 MCM. The annual gross groundwater draft required by the Coca-Cola factory is 0.1825 MCM at 5 lakh litres per day. It can be seen that this quantity is reasonably less than 0.21 MCM mentioned earlier. It can be therefore, concluded that there is adequate scope for the Coca-Cola factory to withdraw groundwater at the rate of 5.0 lakh litres per day. However, it is to be understood that this is true only under normal rainfall conditions, since the assessment of groundwater resources had been made with reference to the mean annual rainfall. There will be scarcity of groundwater in those years when the rainfall is significantly less than the mean value. There is therefore, a need also to regulate the groundwater withdrawal by Coca-Cola factory, during the years when the rainfall is less than the mean.

Consider the rain gauge at Chitturpuzha maintained by CWRDM. Information on monsoon, non-monsoon and annual rainfall as recorded at this rain gauge station for a 10 year period between 1994-95 to 2003-04 are presented in Table-2. The monsoon season rainfall accounts for nearly 85% of the annual rainfall. The balance 15% of rainfall during the non-monsoon season also falls mostly during April and May, as pre-monsoon

showers. It is therefore, reasonable to consider only the monsoon season rainfall for regulating the groundwater withdrawals.

The results show that the rainfall each year varies significantly from the mean. For example, the number of years when the monsoon season rainfall (June-November) is greater than or equal to the mean value is 4. A typical regulation measure that can be tentatively adopted is given in Table 1. These regulations should be implemented during the period between 1<sup>st</sup> February and 15<sup>th</sup> of June.

The above recommendations are very practical from the point of view of convenience of implementation. The recommendations will also protect the interests of domestic and irrigation water supply sectors adequately well, and will also ensure that the developmental opportunities, which the industrial establishments can create in an area that is otherwise predominantly agrarian, are fully utilized. The recommendations that have been made are however tentative and have scope to be refined and improved during the remaining period of the project.

**Table 1 Evaluation of the Scope for groundwater Withdrawal by Hindustan Coca Cola beverages Pvt. Ltd., Palakkad**

**A) Groundwater Resources of Chittur Block in Palakkad District as Given in the 2003 Report of the Central Groundwater Board**

* Total annual groundwater recharge in Million Cubic Meters (MCM)	:	74.1
* Annual available groundwater resources		
* in MCM	:	66.7
* as a % of annual groundwater recharge	:	90
* Current (2001 AD) annual groundwater draft in MCM		
* Combined Domestic and industrial water supply	:	21.1
* Irrigation water supply	:	28.8
* TOTAL	:	49.9
* Current (2001 AD) stage of groundwater development as a %	:	74.8
* Annual gross groundwater draft that is reserved up to 2025	:	23.4
* Balance annual groundwater draft that is available to meet irrigation water supply	:	43.3
(stage of groundwater development is 100%)		
* Additional gross groundwater draft that can be developed over and above what is already currently (2001 AD) extracted		
* Combined Domestic and industrial water supply	:	2.3
* Irrigation water supply	:	14.5
* TOTAL	:	16.8

**B) Data on Area and Population of Chittur Block**

* Geographic area in Sq Km	:	261.24
* Cultivable land		
* in Hectares	:	18,287
* as a % of geographic area	:	70
* Irrigated areas		
* in Hectares	:	9,144
* as a % of cultivable area	:	50
* Year for which population data is available		
* latest census year	:	2001
* Census year just prior to the latest	:	1991
* Future year till which a reservation of groundwater resources can be made to meet domestic and irrigation water supply	:	2025
* Population in numbers		
* as per 1991 census	:	149,821
* as per 2001 census	:	158,510
* Population growth in per cent per year		
* Between 1991 and 2001 as per population data	:	0.5654
* Between 2001 and 2005 as assumed in this report	:	0.60
* Estimated population in numbers in year 2025 AD	:	172,951

**C) Committed groundwater resources to be reserved to meet domestic and irrigation water supply till 2025 AD and the balance to meet other uses**

* Domestic water supply to be ensured in litres per capita per day	:	160
* Share of groundwater resources as a % of total water required to meet domestic water supply as a %	:	100
* Efficiency of the system that harness and supplies groundwater to meet domestic water supply as a %	:	60
* Annual irrigation water requirement in metres per unit area	:	0.60
* Share of groundwater resources as a % of total water required to meet irrigation water supply	:	50
* Efficiency of the system that harness and supplies groundwater to meet irrigation water supply	:	60
* Groundwater resources to be reserved to meet the annual water requirement up to 2025 AD	:	
* Domestic water supply	:	16.8
* Irrigation water supply	:	45.7
* TOTAL	:	62.5
* Balance annual groundwater resources available for uses other than domestic and irrigation water supply in MCM	:	4.2

**D) Annual Gross Groundwater Draft Required by Hindustan Coca Cola Beverages Private Limited, Palakkad**

* Average daily requirement in lakhs of liters per day	:	5.0
* Annual gross groundwater draft required in MCM	:	0.1825
* as a percentage of the balance groundwater resources available after accounting for the committed groundwater resources reserved to meet domestic and irrigation water supply till 2025 AD	:	4.35

**E) Annual Gross Groundwater Draft that can be Permitted to be Extracted by Hindustan Coca Cola Beverages Pvt. Ltd., Palakkad**

- \* During the period between the onset of the south-west monsoon and the end of January, the permitted withdrawal can be always 5.0 lakh litres per day
- \* During the period between beginning of February and the onset of the south-west monsoon, the permitted withdrawal can be as given below
  - \* Consider the rain gauge at Chitturpuzha maintained by CWRDM.
  - \* Let the deviation of the south-west (Jun-Aug) and north-east (Oct-Nov) monsoon rainfall combined together in a given year from the mean value expressed as a percentage of the corresponding mean be “X”

Sl No.	Range of “X”	Permitted Groundwater Withdrawal in Lakhs of Litres per Day
1	“X” greater than or equal to zero %	5.0
2	“X” less than zero % and greater than or equal to 10%	4.0

3	“X” less than 10 % and greater than or equal; to 20%	3.0
4	“X” less than 20% and greater than or equal to 30%	2.0
5	“X” less than 30%	0.0

**Table 2 Monsoon, Non-monsoon and Annual Rainfall as Recorded in Chitturpuzha Raingauge Station in Palakkad District**

**Location of Raingauge**

\* Latitude : 10° 41’ 15” N

\* Longitude : 76° 44’ 00” E

Sl. No.	Year	Rainfall During									
		South-west Monsoon Season (Jun-Aug)		North-east Monsoon Season (Sep-Nov)		Monsoon Season (Jun-Nov)		Non-monsoon Season (Dec-may)		Annual Period (Jun-May)	
		Rainfall in Millimetres [mm]	Deviation from the Mean as a % of the Mean, “X”	Rainfall in Millimetres [mm]	Deviation from the Mean as a % of the Mean, “X”	Rainfall in Millimetres [mm]	Deviation from the Mean as a % of the Mean, “X”	Rainfall in Millimetres [mm]	Deviation from the Mean as a % of the Mean, “X”	Rainfall in Millimetres [mm]	Deviation from the Mean as a % of the Mean, “X”
1.	1994-95	1,265	51.3	667	75.1	1,932	58.8	203	3.6	2,135	51.1
2.	1995-96	871	4.2	393	3.1	1,264	3.9	185	-5.6	1,449	2.5
3.	1996-97	791	-5.4	407	6.8	1,198	-1.6	232	18.4	1,430	1.2
4.	1997-98	986	17.9	414	8.7	1,400	15.0	93	-52.6	1,493	5.7
5.	1998-99	973	16.4	449	17.8	1,422	16.8	337	71.9	1,759	24.5
6.	1999-00	852	1.9	355	-6.8	1,207	-0.8	137	-30.1	1,344	-4.9
7.	2000-01	815	-2.5	233	-38.8	1,048	-13.9	137	-30.1	1,185	-16.1
8.	2001-02	703	-15.9	384	0.8	1,087	-10.7	194	-1.0	1,281	-9.3
9.	2002-03	568	-32.1	244	-36.0	812	-33.3	219	11.7	1,031	-27.0
10.	2003-04	532	-36.4	266	-30.2	798	-34.4	223	13.8	1,021	-27.7

Mean Rainfall in mm	836	381	1,217	196	1,413
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Number of Years when					
a) X >= 0%	5	6	4	5	5
b) 0% > X >= -10%	2	1	2	2	2
c) -10% > X >= -20%	1	0	2	0	1
d) -20% > X >= -30%	0	0	0	0	2
e) X < -30%	2	3	3	3	0
<b>Total Years</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>

## REFERENCES

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8. "Water quality report", prepared by State Groundwater Department, Thiruvananthapuram, November 2002.
9. "Groundwater Resources and Development Potential of Palaghat District, Kerala, CGWB, March, 1997.
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Annexure – 1

## HYDROLOGICAL INFORMATION OF THE OBSERVATION WELLS

Well No. & Well type	Owners name & Address	Latitude & Longitude	Total depth of well below ground Level	Depth to GWL below ground level in meters (19-1-04)	H.P/ Duration	Reported effect of the company	Distance from the company	Purpose D/I/B	Remarks
1 OW	Sri. Natarajan N.R Stores Kannimari	10°38'36" 76°49'12"	8.95	6.615	Pump fitted but not used (1 H.P)	Quality problem	23.75	Not Used	Near to the company
2 BW	Sri. Natarajan N.R Stores (same as Sl. No.1)	ONLY WATER QUALITY monitoring							Only for quality monitoring by SGWD
3. OW	Sri. K Appuswami, Thottichipathy	10°38'27" 76°49'14"	8.88	7.58	5 H.P	No effect	229.80	Irrigation & Domestic	Opposite to company, other side of road
4 BW	Sri. Retnaswami, Thottichipathy	10°38'28" 76°49'19"		21.14	5 H.P 18 hours	No effect	316.90	Irrigation	
5. OW	Sri. Lakshmana Kounder, Thottichipathy	10°38'30" 76°49'17"	9.60	9.15	1.5 H.P Not working	No effect	271.90	Irrigation & Domestic	Weathered and jointed Gneiss and Quartz vein
6 OW	Sri. Devarajan, Plachimada	10°38'38" 76°49'08"	10.91	7.60	0.5 H.P	Quantity & quality problem	7.50	Domestic	Weathered rock square well
7 OW	Sri. Aruchami Kopunder, Plachimada	10°38'48" 76°49'09"	9.21	6.89	5 H.P		53.00	Irrigation	

8 OW	Sri. Pazhanimalai, Plachimada	10°38'57" 76°49'10"	8.75	6.012	3.0 H.P	No effect	141.60	Domestic & Irrigation	Circular Canal influence felt
9 OW	Sri Sudevan, Plachimada	10°38'56" 76°49'13"	6.65	3.48	No pump	Quality problem	24.00	Domestic	Circular irregular South of the canal; canal influence just back of the factory
10 OW	Sri. Rengawami Kounder, Kambalathara	10°38'49" 76°49'23"	6.10	4.80	5 H.P	Extreme quantity problem	39.30	Irrigation Square	Near Eastern boundary of the company Reading taken immediately after stopping the pump
11 OW	Sri. Shahul Hameed, Plachimada	10°38'43" 76°49'22"	5.66	5.07	5 H.P	Extreme quantity problem	99.20	Irrigation Square Irregular	
12 OW	Panchayat Bore well Adhivasi Colony	10°38'40" 76°49'05"		10.754	Hand pump		6.00		
13 BW	Panchayat Bore well Adhivasi Colony	10°38'36" 76°49'15"	7.55	3.98	No pump		70.85		
14 OW	Sri. A. C Ravindranath, Azhichira Kannimary	10°38'45" 76°49'00"	8.76	7.695	5 H.P	Quantity & quality problem	252.55	Irrigation & Domestic Perrinnial	Fully weathered formation Irregular (Square well)
15 OW	Panchayat Bore well Plachimada Colony	10°38'38" 76°49'15"		3.375	H.P		92.40		Near south east corner of the company
16 OW	Sri. K.P Balan Plachimada	10°38'07" 76°49'12"	2.66	1.37	Pulley	Quality problem		Domestic Circular	Within the paddy field. North of the canal

17 OW	Sri. Gopalan K, Kambalathara	10°38'30" 76°49'29"	13.06	11.53	1 H.P	Quantity problem	571.50	Domestic & Irrigation	
18 BW	Inside the Coca- Cola Company No:3/6	ONLY WATER QUALITY Monitoring							
19 BW	Inside the Coca- Cola Company No:5/6	ONLY WATER QUALITY Monitoring							
20 OW	Inside the Coca- Cola Company (OW-1)	10°38'53" 76°49'18"	8.90	1.813					Well within the company
21 OW	Government Poramboke	10°39'03" 76°49'19"	1.42	0.765	No pump		285.45	Domestic Circular	Near to a branch canal
22 OW	Meenakshi Amman, Kambalathara	10°38'48" 76°49'35"	8.45	3.070	5 H.P		447.10	Irrigation & domestic Square	Near to reservoir (Kambalathara)
23 BW	BW-6, Within the Coca-Cola Company	10°38'50" 76°49'20"		5.565					BW No. 6 With in the company
24 OW	Inside the Coca- Cola Company (OW-2)	10°38'48" 76°49'19"	11.0	2.95					

**Appendix II B**

**Water Level Data as Recorded from Observation Wells Located in the Vicinity of Hindustan Coca Cola Beverages Private Limited, Palakkad**

Sl. No.	Date of Observation	Number of Days Since Start	Depth to Water Level below Measuring Point in Metres									
			OPEN WELLS							BORE WELLS		
			(Not Fitted with Pumps)				(Fitted with Pumps, but only for Domestic Use)		(Fitted with a Pump that is Not Used New)	(Fitted only with Handpumps)		
			9	13	16	21	6	17	1	12	15	
1	19/01/04	0	3.48	3.98	1.37	0.76	7.67	11.53	6.62	10.75	3.37	
2	26/01/04	7	3.66	4.83	1.38	0.81	8.70	11.50	7.37	11.50	3.11	
3	02/02/04	14	3.80	4.88	1.39	0.76	8.90	11.66	7.30	11.52	3.18	
4	09/02/04	21	3.60	4.92	1.36	0.80	8.91	12.02	7.37	11.53	3.08	
5	16/02/04	28	3.99	5.10	1.40	0.90	8.90	11.89	7.47	11.64	3.82	
6	23/02/04	35	4.42	5.18	1.42	0.87	9.16	12.04	7.52	11.86	5.23	
7	01/03/04	42	4.76	5.26	1.51	0.87	9.31	12.18	7.60	11.97	4.64	
8	04/03/04	45	4.83	5.35	1.66	0.96	9.35	12.33	7.58	12.00	4.05	
9	08/03/04	49	5.00	5.49	1.74	0.96	9.35	12.40	7.64	12.08	3.58	
10	11/03/04	52	5.10	5.75	1.85	1.05	9.60	12.42	7.56	12.12	4.92	
11	15/03/04	56	5.26	5.63	1.94	1.02	9.92	12.52	7.65	12.20	3.68	
12	22/03/04	63	5.65	5.84	2.08	1.13	10.27	12.76	7.47	12.37	3.73	
13	29/03/04	69	5.70	5.91	2.12	1.30	10.42	12.94	8.37	12.54	3.86	
14	05/04/04	76	NR	6.03	2.16	1.28	10.52	12.93	8.25	12.72	3.95	
15	12/04/04	83	NR	6.00	2.28	1.37	10.75	13.20	8.29	12.83	4.10	
16	19/04/04	90	6.36	6.25	2.32	1.47	10.98	13.20	8.26	12.89	4.19	
17	24/04/04	97	6.58	6.23	2.29	1.62	11.04	13.22	8.35	13.05	4.54	
18	03/05/04	104	6.79	6.35	2.16	1.46	11.07	13.30	8.17	13.06	4.22	
19	10/05/04	111	6.30	6.03	1.55	1.10	10.99	13.25	NR	12.76	3.73	