INTERMEDIATE TECHNOLOGY DEVELOPMENT GROUP

ASSESSMENT OF THE APPLICATION OF APPROPRIATE TECHNOLOGIES IN THE IMPROVEMENT OF RURAL WATER SUPPLY IN SRI LANKA

- SOME PROPOSALS -

JULY 1992

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FOREWORD

This report is the outcome of a request by the Intermediate Technology Development Group to study the potential for new involvements in the water and sanitation sector.

Basically the study has been approached on two frontiers. The first being the study of the existing coverage of water supply in various sectors in Sri Lanka. The second being the study of available treatment options applicable in a rural set up bearing in mind that new involvement if any should be in the rural sector.

The study of these two aspects has lead to the findings in areas which ITDG's further involvement would be most welcome.

Though this report does not follow the items in the terms of reference sequentially it addresses itself to all the items in the original terms of reference. This terms of reference has been rearranged slightly so that all items follow in a logical sequence leading upto the final findings which was the original objective.

Finally we take great pleasure in forwarding this report and thank everyone who was involved during the course of its preparation.

S.K. Wijetunge

S.J.P. Wijegoonewardene

ACKNOWLEDGEMENT

The authors wish to thank the following organisations who helped with numerous data during the course of this study.

1. Intermediate Technology Development Group
2. National Water Supply and Drainage Board
3. Department of Census and Statistics
4. Sarvodaya
5. NGO Decade Service
6. Janatha Estates Development Board
7. Sri Lanka State Plantations Corporation
8. Ministry of Rehabilitation and Reconstruction
9. Ministry of Health

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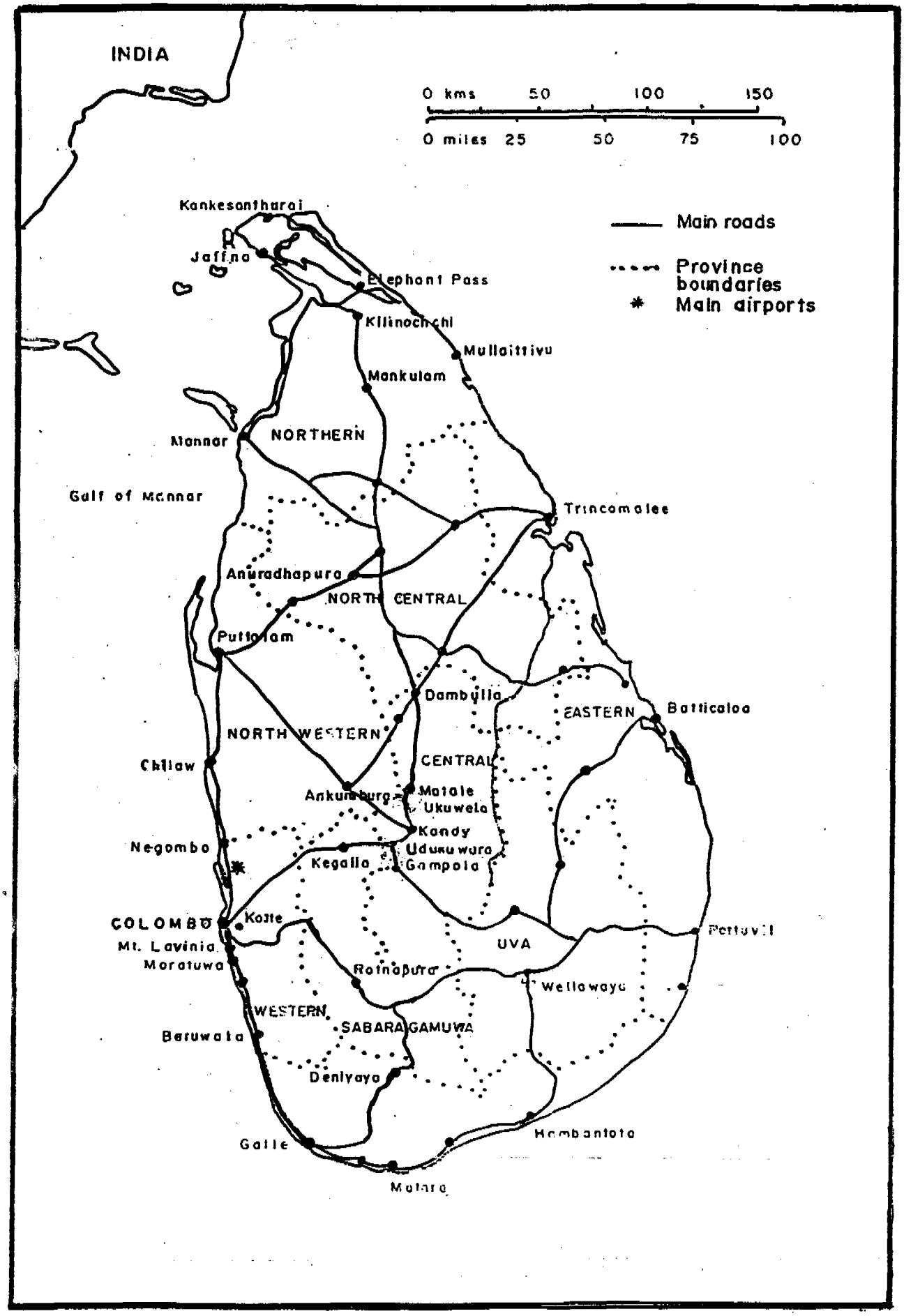
Sri Lanka


INDIA
0 kms 50 100 150
0 miles 25 50 75 100
Main roads
Province boundaries
Main airports
Kankesanthurai
Jaffna
Elephant Pass
Kilinochchi
Mullaittivu
Mankulam
Mannar
NORTHERN
Gulf of Mannar
Trincomalee
Anuradhapura
NORTH CENTRAL
Puttalam
Dambulla
EASTERN
Batticaloa
NORTH WESTERN
Chilaw
CENTRAL
Ankumburg
Matale
Ukuwela
Kandy
Udunuwara
Negombo
Kegalla
Gampola
COLOMBO
Kotte
Mt. Lavinia
Moratuwa
UVA
Ratnapura
Wellawaya
WESTERN
SABARAGAMUWA
Beruwala
Deniyaya
Galle
Hambantota
Matara

List of Abbreviations

ADB	–	Asian Development Bank
AGA	–	Assistant Government Agent
CBO	–	Community Based Organization
CEA	–	Central Environmental Authority
CIDA	–	Canadian International Development Agency
Cu.m.	–	Cubic Metres
CWSPU	–	Community Water and Sanitation Planning Unit
CSSS	–	Community Support and Sanitation Section
DANIDA	–	Danish International Development Agency
DDC	–	District Development Council
DPU	–	District Planning Unit
DDP	–	District Development Plan
DSD	–	Divisional Secretaries Division
FHW	–	Family Health Worker
FINNIDA	–	Finnish International Development Agency
FRP	–	Financial Recovery Programme
GM	–	Gramodaya Mandalaya
GN	–	Grama Niladhari
GND	–	Grama Niladhari Division
GOSL	–	Government of Sri Lanka
GTZ	–	German Agency for Technical Co-Operation Federal Republic of Germany
ITDG	–	Intermediate Technology Development Group
IDA	–	International Development Agency
IDWSSD	–	International Drinking Water Supply and Sanitation Decade
IRC	–	Information Reference Centre for Community Water Supply
IRDP	–	Integrated Rural Development Programme
JEDB	–	Janatha Estates Development Programme
JTF	–	Janasaviya Trust Fund
LLDF	–	Local Loans Development Fund
MEA	–	Mahaweli Economic Agency
MECA	–	Mahaweli Engineering and Construction Agency
MGD	–	Million Gallons per day
MOF	–	Ministry of Finance
MHC	–	Ministry of Housing and Construction
MH	–	Ministry of Health
MP	–	Ministry of Parliament
MPC	–	Member of Provincial Council
MPPI	–	Ministry of Policy Planning and Implementation
MOH	–	Medical Office of Health
NIHS	–	National Institute of Health Science
NORAD	–	Norwegian Agency for International Development
NOVIB	–	Netherlands' International Development Authority
NTDS	–	National Training Delivery Systems

NWSDB	–	National Water Supply & Drainage Board
NHC	–	National Health Council
ODA	–	Overseas Development Agency
PHI	–	Public Health Inspector
PIP	–	Priority Investment Plan
PS	–	Pradeshiya Sabha
RSU	–	Rural Sanitation Unit
SIDA	–	Swedish International Development Authority
SLSPC	–	Sri Lanka State Plantations Corporations
SRTS	–	Sarvodaya Rural Technical Services
SSM	–	Sarvodaya Shramadana Movement
UC	–	Urban Council
UNICEF	–	United Nations Childrens' Fund
UDA	–	Urban Development Authority
UNDP	–	United Nations Development Programme
UPU	–	Urban Programme Unit
USAID	–	Department of State Agency for International Development/USA
WHO	–	World Health Organisation
WRB	–	Water Resources Board

ASSESSMENT OF THE APPLICATION OF APPROPRIATE TECHNOLOGIES IN THE IMPROVEMENT OF RURAL WATER SUPPLY IN SRI LANKA

1. Introduction

Sri Lanka is an island in the Indian Ocean situated off the southern tip of India. Its land area is about 65,000 square kilometres. The island is pear shaped. The south-central region is mountainous with elevations ranging from 900 to 2,100 metres. The rest of the land is on the plains. Beneath the superficial deposits, the bed-rock over 90% of the island is composed of precambrian crystalline rock. Over the remaining 10%, mainly along the North-West coastal belt, sedimentary rocks of jurassic and miocene age are encountered.

The climate is tropical with little seasonal variation. Mean monthly temperatures in most parts of the island range from 26 °C to 28 °C in the plains. The elevated areas are cooler with a greater temperature variation. The island can be roughly divided into a Wet Zone covering about a quarter of the island in the South-West with an average annual rainfall of about 2400 mm and, a Dry Zone over the rest of the island with approximately 1400 mm of average annual rainfall.

The rivers of the island originate in the central mountainous region and flow in all directions to the sea. The estimated mean annual precipitation on the island has been estimated as 110 cubic kilometres. The mean annual stream flow run-off of the 103 river basins is estimated as 51 cubic kilometres which is about 47% of the total precipitation. About 40% of this flows through the Dry Zone where intricate irrigation systems extending to over 2000 years prevail.

The census of 1971 indicated the country's population as 11,689,897 and the census of 1981 showed a population of 14,846,750. Of this about 4,000,000 live in urban areas and the rest live in rural areas. There are 12 Municipal Councils, 39 Urban Councils and 157 Pradeshiya Sabhas. The estimated National annual growth rate is around 1.3% per annum and accordingly the projected population at the end of 1991 is 17,384,729.

In recent years it has been observed that there is considerable migration of rural population to the cities and

sub-urban areas. The attributed reasons are that the present Government's economic policies encouraged industrial growth which created a demand for labour and also the expansion in tourist industry caused incidence of unplanned ribbon development along the peripheral coastal roads, particularly, those to the North and South of Colombo. This haphazard urban development in fact resulted in multiplication of slum settlements for which the required infrastructure services could not be developed to match.

In Sri Lanka there is a high incidence of disease resulting from poor environmental conditions. Barring hospitalisation for heart disease and childbirth, intestinal infections remain the highest cause for hospitalisation. A large proportion of all hospital admissions are due to preventible communicable diseases. Most of these are associated with inadequate drinking water supply and insanitary environmental conditions. The numbers afflicted were very high even up to 1985 especially in urban and estate sectors. This situation has been corrected with some action by the Health and Plantation Authorities over the past five years to reduce the incidence of water-related diseases. However, it could be observed that in respect of urban and some stray cases of Estate and rural areas high incidence of bowel diseases and out breaks of epidemic proportions have occured and continue to occur. This is mainly due to low hygienic and environmental conditions the low income group population is exposed to.

OBJECTIVE OF THE STUDY

Basic objective of this report is to study and review the present status of the drinking water supply available to the rural population in Sri Lanka. Many organisations have been involved in these studies during the water decade programme and there are volumes of literature with statistical analyses and implementing programmes. Therefore, this study essentially involves examination and interpretation of the findings of other studies and identifying and developing appropriate strategies for incorporation in this report with a view to involving the ITDG for sponsoring suitable implementable programmes.

Bearing this in mind the following terms of reference was developed for the purpose of this study.

i. Review of existing reports literature on the coverage of water supply and purification in Sri Lanka.

ii. Identification of needs for water supply in selected districts in Sri Lanka.

iii. Preparation of information related to NGO activities in water supply in various districts.

iv. Preparation of list of other Donor funded projects ongoing or completed in the various districts.

v. Collection of Data on water borne diseases in selected districts including the estate sector, and refugee camps.

vi. Identification of probable districts for the involvement of ITDG.

vii. Prepare an inventory of appropriate treatment options available and make recommendations for other appropriate treatment methods.

viii. Identification of projects for sponsorship by ITDG.

xi. Preliminary cost estimates for identified projects.

Details studies and field surveys have been carried out in selected districts under the preparation of District plans and priority investment plans within Sri Lanka.

The status of these plans for various Districts are given below.

SRI LANKA WATER SUPPLY AND SANITATION SECTOR STUDY
PRESENT WATER SUPPLY COVERAGE

Description	Urban	Rural	Total
Present Population	3,663,000	13,954,000	17,617,000
Population served	3,229,000	9,042,000	12,271,000
% of Population served	3,663,000	13,954,000	17,617,000
Balance population	435,000	4,912,000	5,346,000

Service Level

Description	Urban	Rural	Estate	Total
Piped Supply, within premises	37.6%	3.2%	-	13.3%
Piped Supply, outside premises	25.1%	4.7%	54%	8.8%
Protected well, within premises	10.3%	24.1%	22%	27.6%
Protected well, outside premises	15.0%	33.0%	-	26.0%
Unprotected/Unspecified source	12.0%	35.0%	24%	24.3%
	100	100	100	100

Sanitation Coverage

Description	Urban	Rural	Total
Present Population	3,663,000	13,954,000	17,617,000
Population served	2,958,000	9,834,000	12,609,000
% of Population served	81%	70%	71%
Balance population	705,000	4,120,000	5,008,000

OVERALL SECTOR SUMMARY OF IMPROVEMENTS IN WATER SUPPLY LEVEL OF SERVICES REQUIRED OVER THE PERIOD 1987-1995

Sector and Type of Water Supply	1995 Target Service %	Assessed Coverage as at December 86 (See Annex 2.5) Number 1000	%	Target Coverage as at December 95 Number 1000	%	Estimated Population Requiring Improvements to Service Number 1000
Rural and Estates Sector						
Piped supplies	15	1754.0	10.9	2203	11.8	448.6
Protected wells	85	8356.0	51.9	12487	67.2	1450.9
Unprotected sources	Nil	2680.1	16.6	-	-	2680.1
SUB TOTAL		12790.5	79.4	14690	79.0	4579.6
URBAN SECTOR						
Piped supplies	100	1893.7	11.8	3898	21.0	588.5
Protected wells	Nil	1277.9	7.9	-	-	1277.9
Unprotected sources	Nil	137.9	0.9	-	-	137.9
SUB TOTAL		3309.5	20.6	3898	21.0	2004.3
ALL SECTORS						
Piped supplies	32.8	3648.1	22.7	6101	32.8	1037.1
Protected wells	67.2	9633.9	59.8	12487	67.2	2728.8
Unprotected sources	Nil	2818.0	17.5	-	-	2818.0
TOTAL		16100.0	100.0	18588	100.0	6583.9

Notes :

1. 1995 TARGET SERVICE LEVELS (NWSDB STRATEGIC PLAN, MACRO INVESTMENT JAN 85)
   - Urban areas - 100% piped supplies by 1995
   - Rural estates areas - 15% piped supplies by 1995 (based on 11.5% rural and estimated 75% for estates)

2. POPULATION FORECAST
   - Statistics Department, Central Bank of Sri Lanka (1986 data)
   - ATPL Abeykoon - A Population Projection for Sri Lanka 1981-2011 (1995 data)

Source : Rural Water Supply and Sanitation Sector Study

The traditional Sri Lanka method of fetching water is by sing the rope, pulley and bucket. It is very difficult to change customs and practices that have come down from ancient times with the anticipated suddenness to merely implement a programme. Such changes may be effected gradually over a period. High weightage was given to this factor in the selection of technologies. The proposals have to be acceptable to the community and should essentially be affordable. In the light of this approach the objective has been to opt for low cost technologies.

In the course of this study the projects designed and implemented by Donor Agencies and NGOO were carefully evaluated. During the Water Decade Programme it has been observed that the achievements, especially in the rural water supply sector, have been below the anticipated level all over the world. Unfortunately, programme in Sri Lanka further slowed down due to the social unrest that prevailed in country towards the end of the Decade Programme. Post evaluations of the decade programme revealed that the methodology used thereto were inappropriate and recommendations have been made for effecting necessary changes in order to achieve the anticipated targets.

Sri Lanka has initiated an accelerated housing development programme in order to enhance the life styles of the low income group. The Provision of the component infrastructure services have not been programmed to keep pace with the Housing development programme. This situation has been taken into account in this study. Besides, the Estate Sector and the Refugee and the Displaced persons have been independently studied.

Thus this report has been compiled illuminating situations for which the ITDG involvement is desired with a view to developing rural water supply in Sri Lanka for the purpose of uplifting the standard of living of the Rural Community.

1. REVIEW OF EXISTING REPORTS/LITERATURE ON THE STATUS OF WATER SUPPLY AND PURIFICATION IN SRI LANKA

The reports on the status of water supply in Sri Lanka are many and varied. However the study revealed that with respect to methods appropriate purification methods that could and are practised in Sri Lanka the available literature are few.

However a comprehensive list of literature available with respect to water supply and purification in Sri Lanka is reproduced in Appendix 1 of this report.

In the short time frame available it has not been possible to evaluate all of these reports. However important information relevant for the purpose of this study has been obtained from these reports and are presented in the following chapters of this report.

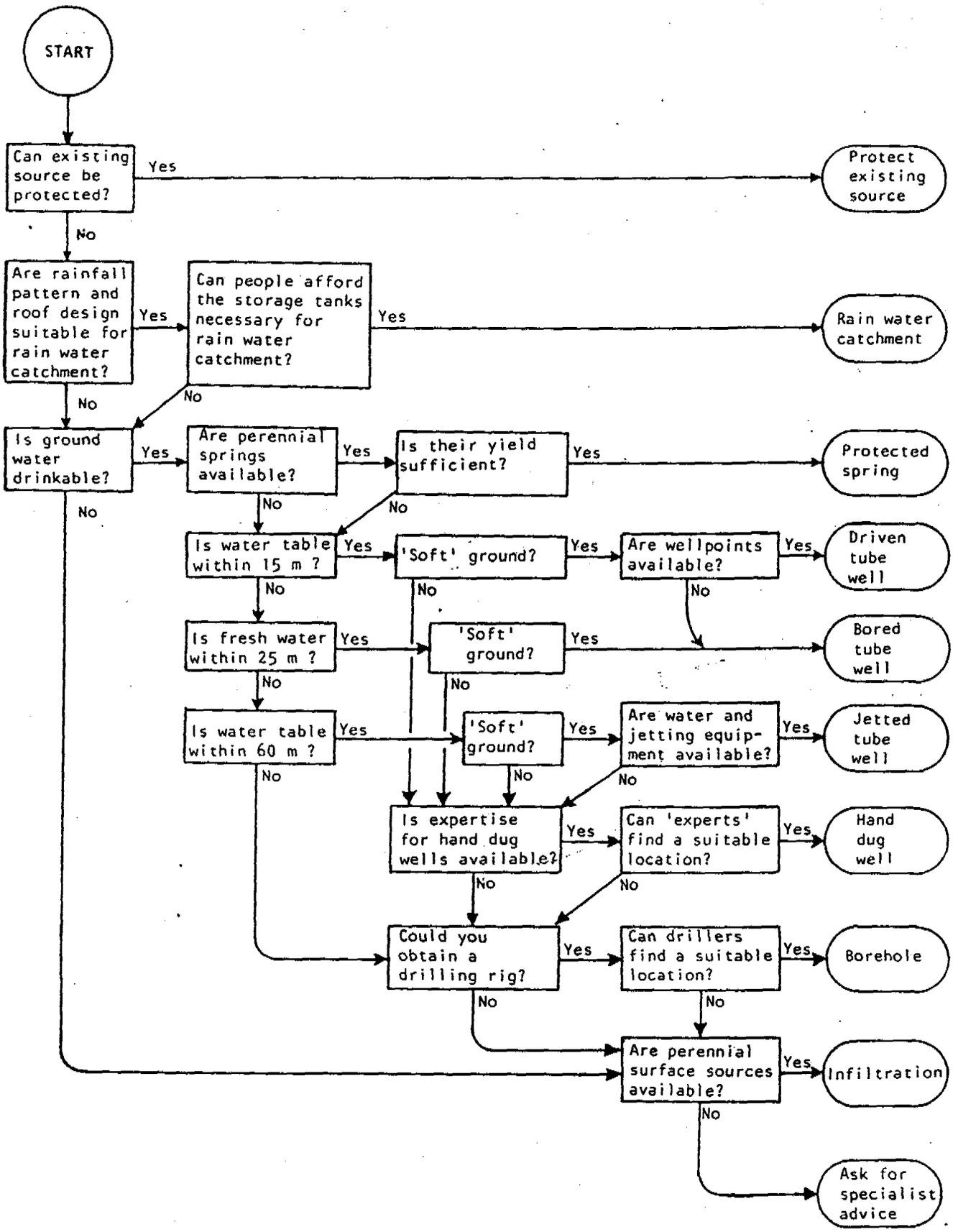
2. INVENTORY OF APPROPRIATE TREATMENT OPTIONS AVAILABLE

2.1 Sources of Water

The essential point of deciding on any drinking water to a community is the identification of a suitable source for the water supply.

This is very complex in nature due to the presence of many alternatives.

The following algorithm will help to identify the nature of source (Ref(1) WASH Technical report No. 14 - 1981).



Choosing a source of water. Follow the arrow corresponding to your answer to the question in each box.

2.2 Consumption of Water for Rural Communities

The demand for water has been traditionally assessed by assuming that a person served by standposts will consume 45 litres per day. House connections are strictly not applicable in the case of rural communities.

However various theories have been developed to estimate the actual quality of water consumed one such equation developed in the Hague Netherlands for the water consumption in a family is

$$Q = q_o + n\ q_c$$

n is the number of family members, q_o is a fixed quantity for a household and q_c is a variable quantity used by each family member
(Ref 2 Huisman, Gorkun Kenpernaar)

It is also stated that from data obtained in Tanzania it was found that this could be approximated.

To $Q = 25 + n\ (5)$ for unpiped household

$Q = 200 + n\ (80)$ for household with piped connections

Ref 2 Huisman, Gorkun Kenpernaar goes on to state that the following formulas could be adopted. If the average per capita consumption for a family of five is q.

<u>Unpiped supplies</u>

Minimum $Q = 10 + n\ (5)$ ie $q = 7$ litres/day

Adequate $Q = 30 + n\ (7)$ ie $q = 13$ litres/day

<u>Piped Supplies with Standposts</u>

$Q = 50 + n\ (10)$ ie $q = 20$ litres/day

<u>Households with piped connections</u>

Small village $Q = 100 + n\ (20)$ ie. $q = 40$ litres/day

Large village $Q = 125 + n\ (25)$ ie. $q = 50$ litres/day

In the formulae of the above it is assumed that 2-5 litres will be used by a person to perform its physiological functions properly and includes for water required for other duties such as cleaning, cooking utensils, personal hygiene, laundry and house cleaning.

The above water consumption patterns could be adopted in the case of computing water demands in rural communities as differing from the normal accepted consumption patterns.

2.3 Sources of Water as applicable to Rural Communities with appropriate treatment

2.3.1 Rain water Catchment

Rainwater catchments have been used for drinking water supply from ancient times. In earlier days these took the form of impounding reservoirs.

However at present rainfall run off from roof catchments are popular. If 500 mm of rainfall is available once in six months at 80% efficiency 0.4 m^3/m^2 is available. 12 months for a family of 5 (considering 35 litres per day per family) 12.775 m^3 of water is required. Therefore if a square area of 31.9 m^2 (say 32 m^2) of roof area is available together the total requirement of water per family could be obtained for a rainfall of 500 mm. If the frequency rainless periods of one-half year duration the storage required is 32 x 0.4 x 0.5 ie. 6.4 m^3.

Allowing for evaporation losses the storage requirement would be around 8.0 m^3 per family.

Typical rain water collection systems are shown in Figure 1 and Figure 2.

The working of a rainwater supply system

The collection of rainwater for water supply involves not only the collection of rainwater but also the storage of this water in a reservoir.

Water for consumption is then tapped from this reservoir.

A rainwater harvesting system therefore consist of the following parts. (See fig -1)

1.	Catchment area or collection surface	:	In many cases an existing roof can be used
2.	Gutter or Gutters	:	For the collection of rainwater
3.	Inflow pipe	:	For transfer of the rainwater to the reservoir
4.	Filter	:	For filtration to remove pollutants
5.	Reservoir	:	For storage during periods of insufficient rainfall
6.	Tap	:	For tapping of the water from the reservoir
7.	By pass pipe	:	A pipe for diverting initial rainfall to waste (in order to prevent pollutants entering)

Criteria for selection of a roof for use as a catchment area

For the selection of a suitable roof as a catchment area the following criteria are of importance.

1. Approximately 40 m^2 of roof surface is required.

2. The roofing material should be of tile. Slate or corrugated plates of Aluminum or galvanized iron preferably not asbestos cement.

   Under no circumstances may thatched roofs or roof coverings in which lead is used be utilized as collection surfaces.

3. The entire roof surface to be utilized should be exposed to the rain, that is no trees or obstacles should overhang it.

4. The roof construction and roofing material should be in good condition the roof edge should be strong enough for the attachment of gutters.

5. The roof edge should be situated at least 2.5 metres above ground.

6. The roof surface should be and remain as free as possible from the excrement of birds or other pollutants.

The following sketches are given in the annexes for illustrating a typical rainwater system.

Fig. 1 Principle of Rainwater catchment system

Fig. 2 Typical Rainwater roof catchment system

Fig. 3 Rain water collector of Ferrocement with Filter

Fig. 4 Detail of Ferrocement tank 1500 litres and 3500 litres

Cost Estimates for Ferrocement tanks 1500 litres all 3500 litre cost estimate for pipes and fittings required for changing and existing roof to a rainwater collection system are given in Annex 1,2 and 3.

2.3.2 Protected Intake

Water can be abstracted from protected intakes by any of the methods described under the follow. The water thus abstracted could be of reasonably good quality for supply as drinking water after satisfactory disinfection.

The protected intakes can be of the following types.

a. Protected well

b. Tube well with Hand pump

c. Protected spring intakes

d. Infiltration galleries

(a) Protected well

A protected well is classified as a well with a protective parapet and apron with a safe method of abstracting water without causing pollution to the water.

Therefore other methods such as a chain of buckets or a shaduf can be used over the well to abstract water.

The wells can be so constructed to be served by a pulley or a bucket or they can be designed for abstraction of water by a hand pump or a mechanised pump.

The following sketches showing various typical details of wells designed for various abstraction methods are given in the annexes.

Fig. 5 Dug well with apron 1.5 m dia with pulley block - Ref Rural Water Supply Priority Investment Plans Vol V - 1991

Fig. 6 Dug well with apron 2 m dia. with pulley block - Ref Rural Water Supply Priority Investment Plans Vol V - 1991

Fig. 7 Dug well covered 2 m dia for handpumps - Ref Rural Water Supply Priority Investment Plans Vol V - 1991

Fig. 8 Dug well with shallow well handpump - Ref Rural Water Supply Priority Investment Plans Vol V - 1991

Fig. 9 Typical Hand dug well with handpump

Fig. 10 Dug well covered 4 m dia for mechanised pump intake

Fig. 11 Standard detail for a protected dug well

Fig. 12 A chain of bucket device for raising water (Ref. Small Water Supply - Ross Institute)

Fig. 13 A shaduf used over a hand dug well (Ref. Small Water Supply - Ross Institute)

Fig. 14 Bucket and windlass method for protected a well from pollution (Ref Small Water Supply - ROSS Institute)

(b) <u>Tube well with hand pump</u>

Deep and shallow tube wells fitted with hand pumps are a very useful method for providing water to rural communities.

Sometimes the water obtained from tube wells contained dissolved minerals. A typical problem in deep groundwater is the presence of Iron and manganese. With the use of an appropriate filter these minerals could be removed to provide water of adequate quality for human consumption.

A typical installation detail of a hand pump in a tube well is given in Figure 15.

Figure 16, 17 and 18 give typical iron removal plants which could be used with tube wells with hand pump. Alternatively these iron removal plants can also be used on large diameter open dug wells where the chemical quality of water is not satisfactory.

(c) Protected Spring Intakes

Protected spring intakes could provide water of good quality for drinking purposes provided they are protected adequately. Typical methods of protection of springs are given in annexes. However it is not possible to present all possible methods of spring protection as these vary widely depending on the nature of the spring.

Sometimes further treatment may be necessary to remove dissolved minerals such as Iron and manganese and any of the low cost methods for water treatment described herein can be used.

The following sketches are provided to indicate probable protected spring intakes.

1. Spring catchment in line (See Figure 19)

2. Spring catchment in shape of T (See Figure 20)

3. Protection of spring catchment for sloping ground (See Figure 21)

(d) Infiltration Gallery

Water obtained from infiltration galleries are generally are of adequate quality for human consumption with disinfection or boiling. Sand banks besides streams offer excellent opportunities for infiltration wells or shallow dug wells.

Infiltration can be achieved in the following manner.

1. By river well intake on the banks of the river. (Figure 22)

2. By laying of laterals or collector pipes within the river bed (Figure 23)

3. By driving screen pipes into the river (Figure 24)

These infiltration intakes can be used for hand pumps or mechanised pumps as the case may be.

The design and construction details of such Infiltration trenches are given in Figure 25.

2.4 Some low cost treatment methods

2.4.1 Plain Sedimentation

Plain sedimentation is good for removal of turbidity, when particles much heavier than water are present as impurities. Though sedimentation can be accomplished in many ways plain sedimentation is the simplest. However plain sedimentation alone will not produce water of the desired quality and it will have to be followed by some other treatment process such as filtration.

An appropriate plain sedimentation with a dug basin and a built up sedimentation tank of brick masonry are shown in Figures 26 and 27.

Basins for plain sedimentation can be constructed as a simple dug basin with an overflow rate of 1-10 metres. Assuming a value of 2 m/day for the overflow rate and a village of 1000 inhabitants at a per capita consumption of 30 litres the pond required would have the following dimensions 1.5 m depth side slopes of 1:1.5 a bottom width of 2 m and a bottom height of 1.5 m with 7.5 m between the inlet and outlet.

Figures 26 and 27 indicate two simple versions of a sedimentation tank in typical rural set ups.

The first type given in Figure 26 is a dug basin constructed in soil. It is particularly useful if this constructed at an elevation where the draining of the tank could be carried out.

The second type shown in Figure 27 could be constructed out of brick work. The sketch presented is for a flow of 2000 l/hr but however if the flow increases the method of connecting these tanks is also given in this same Figure. Hence it could be seen that this system is available for a wide variation in flows.

A silt box of 300 litres capacity suitable for settling out silt in spring intakes of surface water intakes is shown in Figure 28. This is particularly useful for use in spring intakes where the particulate matter can be settled out at the source itself.

2.4.2 Filtration

Various types of filtration are available for the treatment of water ie. Roughing filtration, Slow sand filtration, Rapid gravity sand filtration and Pressure filtration to name a few. However rapid gravity sand filtration and pressure filtration will not be considered as they are too complicated for maintenance by rural communities.

(a) Roughing Filtration

Roughing filtration is a low cost low maintenance filter constructed with coarse gravel of various diameters.

Filtration using a sand bed, can be adequate for treating the raw water. This can be obtained by using gravel or plant fibres as filter material. Three layers would be used having grain sizes of 10-15 mm, 7-10 mm, and 4-7 mm, from the bottom upward, and with a simple underdrain system. This coarse ("roughing") filter will have large pores that are not liable to clog rapidly. A high rate of filtration, up to 20 m/hour, may be used. The large pores also allow cleaning at relatively low back-wash rates since no expansion of the filter bed is needed. The backwashing of roughing filters takes a relatively long time, about 20-30 minutes.

Another possibility is the use of horizontal filters as shown in Fig. 29. These have a depth of 1-2 m subdivided into three zones, each about 5 m long and composed of gravel with sizes of 20-30 mm, 15-20 mm and 10-15 mm. The horizontal water flow rate computed over the full depth will be 0.5-1.0 m/hour.

This represents a very low surface loading of the filter of only 0.03-0.10 m/hour. A large area will be required, but the advantage is that clogging of the filter will take place very slowly, so that cleaning will be needed only after a period of years. This cleaning is carried out by excavating and washing the filter material after which it is put back in place.

However recent developments have shown that cleaning is possible in these filters using hydraulic methods.

Coconut fibres have been used for filter material in an experimental filter unit similar to a sand filter. The filter bed is only 0.3–0.5 m thick and the depth of supernatant water about 1 m. The filter is operated at rates of 0.5–1 m/hour which gives a length of filter run of several weeks. To clean the filter it is first drained after which the coconut fibres are taken out and discarded. The filter is repacked with new material that has previously been soaked in water for 24 hours to remove as much organic matter as possible. Coconut fibre filters appear to be able to cope with considerable fluctuations in their loading while producing an effluent of almost constant quality. The experiments showed a remarkably constant behaviour of the coconut fibre filters. The overall turbidity removal varied between 60 and 80 percent.

However the removal of pathogens are not as effective as a slow sand filter.

It is envisaged that for a rural population of 2000 persons consuming 30 litres per day would require two horizontal roughing filter of 1.5 m x 1 m of length 6 metres should suffice.

(b) <u>Slow Sand Filtration</u>

Slow sand filtration can remove upto 99% of the bacteria and viruses and could be used in a rural set up as the technology of operation is appropriate through the operation of the slow sand filter requires little skill, it does need regular attention, and it should be careful designed.

A slow sand filter consists basically of a large tank containing a bed of sand. The water filters down through the sand bed to a set of drains which takes it to an outlet well. The filter does not work by a simple straining process. The sand grains in the top layers of the bed become coated with a sticky deposit in which bacteria and microscopic plants multiply. These form a very fine straining mat in the topmost few millimetres, as well as killing most other micro-organisms which pass through.

The tank walls should rise 2.4 metres above the floor and the area in plan should be at least 3 square metres for each 400 litres per hour capacity. The sand should be at least 700 mm deep, and its surface should be at least one metres deep under water. Between the sand bed and the drains there should be three or four layers of

clean gravel, each 75 mm thick. The gravel in each layer should be of uniform size, and about twice as large as in the layer above. So, if the top layer were about 2 mm diameter (this could be left out if the filter sand is quite coarse), the second layer might be 5 mm, the third 10 mm and the fourth about 25 mm diameter. The drains beneath the gravel can be made of bricks laid down without cement and they should not be more than 3 metres apart. The drains lead the water to an outlet chamber, a separate compartment which is kept clean. Water collects in the chamber and flows down the collector pipe, whose top should be a little above the level of the top of the sand. There should ba a valve on the inlet and the outlet pipe, and a drainpipe so that the filter can be emptied when necessary.

If the water being treated is reasonably clear, a slow sand filter may run for weeks or even months without cleaning. If the water going into the filter is very dirty, it is advisable to try to improve it beforehand. This may often be done by sedimentation. However, if the sediment in the water is very fine, it will not settle fast enough for sedimentation to work. An alternative is to use another filter filled with coarse sand or coconut fibre instead of fine sand, or an upward flow filter before the slow sand filter.

It will become obvious when a slow sand filter requires cleaning, because the flow through the filter will slowly drop to the point where it is not enough for the community's needs. It is cleaned by raking off the top 20 mm of sand from the surface of the sand bed and discarding it. When the sand bed is only 600 mm thick, more sand is needed. The old sand can be washed in a box with water slowly piped in at the bottom. This should be continued and the sand disturbed with a spade until the water overflowing from the box becomes clean.

It is also possible to construct slow sand filters of masonry on a foundation of puddled clay such a construction may be quite appropriate in a rural setting.

Some simple slow sand filters are given Figure 30 and 31.

Depending on the treatment plant capacity the required area varies from a few metres to several hundreds of square meters. The maximum filtration rate adopted is 0.2 m/hour.

2.5 Appropriate Domestic Treatment Systems

2.5.1 Trickling sand filter (Ref. 5 Water purification Distribution and Sewage Disposal R-29

An appropriate method of treating water which is similar to a slow sand filter is shown in Figure 32. This is appropriate on a domestic set up.

Sand filtration does not make polluted water safe for drinking. But a properly built and kept sand filter will prepare water for boiling or chlorination that will make it safe. Trickling sand filters if built properly and cleaned periodically, provide clear water that must be boiled or treated with chlorine.

The following tools and materials are required.

Steel drum, 2 feet wide by 29 1/2 inches high
Sheet metal to make cover, 29 1/2 inches square,
9.8 feet of wood, 2 x 4 inches
Sand 7 cubic feet
Gravel
Blocks and nails
Pipe to attach to water supply
Optional valve and asphalt roofing compound to treat drum.

Surface water, from ponds, streams or open wells is very likely to be contaminated with leaves and other organic matter. Trickling sand filter can remove most of this organic material but will always allow viruses and other bacteria to pass through. For this reason it is always best to boil or chlorinate water after filtering.

There are several sand filters, but the trickling filter is the easiest to set-up and understand. The trickling filter uses sand to strain the organic matter from the water, although this does not a always stop small places of organic matter or bacteria. But in time, biological growth forms on the top six inches of sand. This slows down the flow of water through the sand but will trap more small organic matter and, at times, up to 95 percent of the bacteria. But if not operated correctly, the sand filter can actually add bacteria to the water.

By removing most of the organic matter, the filter achieves the following results.

a. Removes larger worm eggs, cysts, and cercariae, which are the hardest to kill with chlorine.

b. Allows the use of smaller and fixed doses of chlorine for disinfecting, which results in drinkable water with less taste of chlorine.

c. Makes the water look cleaner.

d. Reduces the amount of organic matter, including living organisms and their food, and the possibility of recontamination of the water.

The unit shown in Fig.32 should give about 1 quarter of water minute. The drum should be of heavy steel and can be coated with asphalt material so that it will last longer. The .2 millimeter hole at the bottom regulates flow and must not be made larger (slightly less than 1/13th of an inch.)

It is important to use clean, fine sand, but not too fine. The sand should be able to pass through a window screen and it is best to wash it.

The following points are very important in assuring that your sand filter operates properly:

i. Keep a continuous flow of water passing through the filter and do not allow the sand to dry out, as this will destroy the microorganisms that form on the surface layer. The best way to insure a continuing flow is to fix the water intake so that there is always a small overflow. Screen the intake and provide a settling basin to help keep pipes from becoming plugged which would stop the flow of water. This will also delay your having to clean the filter.

ii. Never allow the filter to run faster than 0.6 gallons of water a minute per square foot, as it will prevent the growth of micro-organisms in the sand and wash them out through the outlet.

iii. Keep light from the sand surface but allow air to circulate, as this will prevent the growth of green plant matter on the surface but help the growth of microorganisms that aid the filtering action.

iv. When the flow drops below daily needs, clean the filter. This is done by scraping off and discarding the 1/2 inch of sand and lightly raking or scratching the surface. After several cleanings, the sand should be raised to its former height by adding clean sand. Before doing this, scrape the old sand down to a clean level. Cleaning should not be more often than every several weeks or even months.

2.5.2 Composite Roughing/Slow Sand Filter

As stated earlier slow sand filter should be preceded by some form of pre treatment. At the moment Roughing filtration has been identified as a satisfactory method of pre treatment.

Researchers at the Department of Civil Engineering in the University of Dar es Salaam have developed a composite Roughing and Slow sand filtration unit to reduce space and construction costs. The details of this is shown in Figure 33 which shows two peripheral horizontal roughing filters feeding a slow sand filter at the center.

Further development of this model could provide satisfactory drinking water to small communities.

2.5.3 Collection of subsurface water

This type of unit is described in Figure 34 (Ref 1). It is basically a plastic sheet placed over a water bearing aquifer and the heat from the sun causes the water to evaporate from the soil and collect in the pot.

2.5.4 Two stage Filter Unit

This is a typical filter unit used in Thailand. The water filters through a coarse primary filter with shredded coconuts husks and then filter through burn rice husks. However this can be used with coarse gravel on top and fine gravel at the bottom to give very good results. Basic details of this unit are given in Figure 35.

2.5.5 Artificial Recharge

Rainwater or raw water from a stream can be made to recharge a basin filled with sand and the water withdrawn from a well or pipe located at some distance away from the point of recharge.

A typical detail of such a system are given in Figure 36.

2.5.6 Intake Dynamic Filter

An intake dynamic filter similar to a horizontal roughing filter can be used as shown. This is extremely useful where adequate head exists between the source and the community to be supplied.

This basically acts as a roughing filter and is a useful method of pretreatment. The details of this are given in Figure 37.

2.6 Disinfection

Larger water supplies are usually disinfected by adding chlorine, but it is often an unreliable process when used in smaller communities. The main problem is that, unless the chlorinator is filled every week or two, the chlorine will run out, and there is no easy way of knowing that the water is no longer safe. Chlorine can be obtained in pure gas or liquid form in large pressure bottles, but it is safer and more convenient for small water supplies to obtain it from liquid laundry bleach or bleaching powder. This is easier to obtain than bottled chlorine, but it rapidly loses its strength when exposed to the atmosphere or to sunlight. Even if carefully stored in sealed containers in a cool, dark place, it will lose half its strength in about a year. A stronger disinfectant is High Test Hypochlorite solution or powder, which contains about 70% available chlorine. It is slightly more stable than bleach, but should also be stored in sealed containers in a cool, dark place. Chlorine can kill bacteria, schistosome larvae, some viruses, and, in higher doses, amoebic cysts. There is little danger to health from excessive dosing, but if too much chlorine is added, the unpleasant taste may drive people to use more heavily polluted water instead.

Chlorine should never be applied before slow sand filtration but filtration before chlorination will make the chlorination more effective. Dirty or cloudy water is not suitable for chlorination, because the dirt in the water will absorb the chlorine.

Simple chlorinators, which dispense a chlorine solution at a constant rate, can be bought or made with materials available in most developing countries. But it is difficult to set their adjustment correctly, and you would be wise to seek expert advice before you try to make one. Besides, regular attention is necessary to ensure they run reliably. There is no point at all in using a chlorinator which is not reliable.

Chlorine should not be added to water flowing straight to a tap, or it will not have enough time to disinfect the water before it is used. It should be added to the water in a well or entering a storage tank, because it requires at least half an hour to act. If chlorine is being added to a water supply, the amount of chlorine in the water must be regularly checked because the amount required will vary, depending on the level of pollution. These checks should be carried out on the water as supplied, not just after chlorination. In a piped supply, the water to be tested should be taken from the tap furthest from the source. At this point the 'free chlorine residual' (the amount of chlorine still left to kill bacteria) should be at least 0.3 mg/litre (0.3 parts per million), although to achieve this will usually require an initial dose of at least 10 times as much. A residual of 2 mg/litre is required to kill amoebic cysts. Simple kits for measuring chlorine are available and include instructions for their use. If not enough chlorine is added, it may all be absorbed very quickly by organic matter in the water and have negligible disinfectant effect. This means that disinfection is carried out by the last few parts per million, not the first. It is therefore useless to chlorinate if you are not adding enough chlorine.

The simplest type of chlorinator is a pot containing a mixture of coarse sand and bleaching powder, which is hung underwater in a well (Figure 38) shows two types of pot chlorinator. The double pot is suitable for a well serving up to 20 people and needs to be refilled with 1 kg of bleaching powder and 2 kg of coarse sand every 3 weeks. The single pot will serve up to 60 people if it holds 50% more bleach and sand, but it requires replenishing every 2 weeks. For wells serving larger communities, more pots would be required.

The next most simple type is shown in Figure 39. It can be adjusted to feed chlorine solution at a slow constant rate to water in a tank or even in a pipe if the pressure is low. The largest component is a tank holding about 200 litres; and old steel drum can be used for this. The tank is painted inside with bitumen paint, because chlorine will rust metal and even attack rubber and wood. The tank should have a drain for cleaning out and a cover over the top to keep out

light although it should not be airtight.

The tank is filled with a solution of 1% chlorine in water. This solution can be made up by adding to each litre of water in the tank either:

20 ml (almost 1 fluid ounce) of High Test Hypochlorite solution, or 20 g of powder
or
40 g (3 heaped tablespoons) of bleaching powder (chlorinated lime)
or
250 ml (one cup) of liquid laundry bleach

If bleaching powder is used, an inert sediment will settle to the bottom in a few hours, leaving the chlorine dissolved in the water.

The floating bowl arrangements, shown in Figure 39 and 40 is designed to ensure that the solution trickles out of the outlet at a constant rate. A hole in the bottom of the floating bowl is blocked with a cork or rubber stopper. At least two glass, brass or copper tubes pass through the stopper. One, about 6 mm diameter, is connected to the flexible tube which runs to the outlet. The other, not more than 3 mm diameter, is fixed with its top slightly below the liquid level in the tank, so that solution spurts up it into the bowl, and down through the other tube. You could use a plastic, enamel or glazed ceramic bowl, but the bottom half of an old plastic bottle will do just as well.

As the liquid level in the tank falls, the bowl will move down with it, always floating on the surface. It may be necessary to put stones in the bowl to make it float straight and steadily. In order to stop the bowl catching on the sides of the tank, it may be necessary to fit a third tube through the bottom of the bowl, threaded on a taut nylon string as shown in Figure 40. The flow is reduced by moving it upwards to reduce the height H between its tip and the liquid level in the tank (Figure 40).

To prevent the flow of chlorine solution decreasing to an ineffective level, therefore, the device needs regular adjustment and occasional replacement of the tube.

The chlorinator needs careful maintenance if it is to work correctly. If rubber, rather than plastic, is used for the flexible hose, it will eventually become damaged by the chlorine and require replacement. And of course, you should make definite arrangements for regularly refilling the tank.

Chlorine can also be added through a special regulator from containers of pure chlorine under pressure. However, the regulators are expensive and require particularly careful operation, as chlorine gas can be dangerous. This method of chlorination is not recommended for small water supplies.

A crude water purification plant is described which uses laundry bleach as a source of chlorine. Although lacking the reliability of a modern water system, this manual plant will provide safe drinking water. Many factors in this system depend upon operating experience. When starting to use the system, it is best to have the assistance of an engineer experienced in water supplies.

The details in this system are given in Figure 41.

Operation

a. Mix concentrated bleach with water in the concentrate barrel with all valves closed.

b. Fill the pipe from the mixing barrel to the solution tank with water after having propped the float valve in a closed position.

c. Allow a trial amount of concentrate to flow into the mixing barrel by opening Valve #2.

d. Use the measuring stick to see how much concentrate was used.

e. Close valve #2 and open valve #1 so that untreated water enters the mixing barrel.

f. Close valve #1 and mix solution in the mixing barrel with a stick.

g. Remove the prop from the float valve of the solution tank so that it will operate properly.

h. Open wide the metering valve and valve #4 to clean the system. Allow a gallon to drain through the system.

i. Close down the metering valve until only a stream of drops enters the funnel.

(steps 2, 8 and 9 may be omitted after the first charging of the system, if the pipe mentioned in the second step is not permitted to empty before recharging the mixing barrel).

j. Open Valve #3

Trial and error must be used to learn how much concentrate should be put in the concentrate barrel, the amount of concentrate to flow into the mixing barrel and the amount of solution to allow past the funnel. The result should be water with a noticeable chlorine taste in the distribution barrel.

The flow into the funnel and the taste of the water in the distribution barrel should be checked regularly to insure proper treatment.

Chlorination for polluted water

Chlorination, when properly applied, is a simple way to insure and protect the purity of water. These guidelines include tables to give a rough indication of the amounts of chlorine bearing chemicals needed. The amount of chlorine specified will normally make reasonably safe water. Try to have your water treatment system inspected by an expert, and the water itself periodically inspected.

The surest way to treat water for drinking is to boil the water. However, under controlled conditions chlorination is a safe method, and often more convenient and practical than boiling. Water properly treated has residual free chlorine which resists recontamination. The chlorine in water is not harmful since water with a harmful amount of chlorine in it is extremely distasteful. Proper treatment of water with a harmful amount of chlorine in it is extremely distasteful. Proper treatment of water with chlorine requires some knowledge of the process and its effects.

3. NGOO ACTIVITIES IN WATER SUPPLY IN VARIOUS DISTRICTS

3.1 Member Organizations of the NGO WSS Decade Service

- Girl Guides Association of Sri Lanka
- Family Planning Association
- Sarvodaya Shramadana Sangamaya
- Church of Ceylon Board on Women's Work
- Community Development Services
- Zonta Club of Colombo
- Y.W.C.A. Colombo
- US Save the Children Federation
- Marga Institute
- Y.W.C.A. of Sri Lanka
- Jeevanodaya
- Gami Seva Sevana
- Y.M.M.A.
- Plan International
- Nation Builders Association, Jaffna District
- Women's Conference
- Sarvodaya
- Jaycees International Organization
- National Development Foundation
- 'Asankee'
- Saukyadana Movement
- Lasallian Community Education Service
- Lanka Mahila Samiti
- Sarvodaya Kandy District Centre
- Service Civil International
- Social and Economic Development Centre
- CARE - Sri Lanka

3.2 Non-Government Organizations (NGO) and the NGO Water Decade Service

In Sri Lanka there are at least 150 NGOs, 27 of which are presently members of the Decade Service. Of the member NGOs, not all are actively engaged in water supply and sanitation activities. Most NGOs in Sri Lanka however have community development in their programmes, including some water component. The umbrella organization on NGOs in Sri Lanka is the National NGO Council, comprising some 100 member NGOs.

NGOs may form subsidiaries to work at the village level, and in this situation the legal status of the parent organization also applies to the subsidiaries. When engaging in village level programmes, the NGOs are able to adjust their programme activities to the identified priorities of the villagers. As an example, nutrition programmes,

immunization and family health may precede construction of water supply and sanitation. The NGO WSS Decade Service undertakes health education activities and training of health volunteers for other projects.

NGO WSS Decade Service - Some Highlights in the Water Supply and Sanitation Sector - March 1983 to May 1992

December 1982 – UNDP sponsored consultation meeting of NGOs to set up the Decade Service.

March 1983 – Decade Service was formally launched at a meeting held at the US Save the Children Federation office at Havelock Road.

December 1983 – First Decade Service training programme in collaboration with the UNICEF community wells programme in the Kalutara district was held at Kalutara.

March 1984 – The first workshop funded by UNDP was held at Kitulawa in the Kalutara district in association with the Girl Guide Association, the National Institute of Health Sciences and the National water Supply and Drainage Board (NWSDB).

April 1984 – Decade Service was invited to serve on the Project Designed Team of USAID Water Supply and Sanitation Project.

July 1984 – Decade Service moved into its own office at 26 Melbourne Avenue. First issue of newsletter 'LINKS' in English published.

July 1984 – A resource Book in four sections in a loose leaf cover was launched to be distributed to members.

May/June 1985 – A survey on the water/sanitation status of Punchiwilaththawa completed.

October 1985		Decade Service begins a health education project for six suburban communities in Matara in a water/sanitation programme by the Overseas Development Administration.
October 1985	–	A one day health clinic at Punchiwilaththawa combined with health education using health education material produced by the Decade Service.
November 1985	–	First publications of the Decade Service Development Consortia of Sri Lanka a study of the NGO situation by Vijita Fernando and Henry de Mell (sponsored by PACT) and Women & Water by Vijita Fernando (sponsored by UNDP)
January 1986	–	David Collett, Director of WaterAid London had preliminary talks with the Decade Service on funding NGO water projects through the Decade Service.
February 1986	–	Twenty five health volunteers selected at Punchiwilaththawa and given training at the Marawila District Hospital.
July 1986	–	Exhibition and poster competition on health /water /sanitation at Punchiwilaththawa.
July 1986	–	WaterAid funding began with finances for a Guide Association project at Heenatipone and provision of six wells to Punchiwilaththawa.
July 1986	–	The Sinhala health manual made available to NGOs and others.
Sept./October 1986	–	"Learning & Linkage" collaborative training programme for NGO members launched.

November 1987 – "LINKS" joins hands with the Water Supply and Sanitation Documentation Centre of the NWSDB to publish a special section on WASSDOC news and also to publish Sinhala and Tamil versions of LINKS.

December 1987 – NGO WSS Decade Service gains approved charity status granted by the Ministry of Finance and Planning in a gazette notification.

June 1988 – The Lower Deduru Rural Development Project (LDRDP) in the Puttalam District funded by the Sri Lanka Canada Development Fund began.

November 1988 – The Tamil translation of the Health Manual ready for distribution and sale.

November 1989 – Sri Lanka is featured in the five country study of Asian NGOs published by PACT. The Sri Lanka contribution is by Vijita Fernando and Henry de Mel.

April 1990 – First National Seminar of the Decade Service to highlight activities in water and sanitation by NGOs held.

September 1990 – Chairman of the Decade Service Mr. George Mendis was the Sri Lanka NGO representative to the UNDP Global Seminar to take stock of the International drinking Water Supply and Sanitation Decade in New Delhi, India.

September 1990 – Vijita Fernando, Consultant and Member of the Governing Board was invited to present a paper on the participation of Women in Water and Sanitation project at the 16th annual conference of the Water Engineering and Development Centre (WEDC) of the University of Loughborough, England held in Hyderabad, India.

November 1990	–	A series of workshops funded by NORAD for member NGOs held in Colombo.
February 1991	–	Three day workshop sponsored by PACT to focus on Institutional Development Grants and three topics selected by NGOs – Organic farming, Community Participation and Rural credit.
March 1991	–	LINKS collaboration with WASSDOC ended but the Sinhala and Tamil publications continue.
March 1991	–	Decade Service on the Steering Committee of the NWSDB project to establish a data bank on water supply and sanitation.
July 1991	–	NGOs of Sri Lanka – An Introduction by Vijita Fernando and Henry de Mel, a Decade Service publication sponsored to PACT on sale at the decade Service.
October 1991	–	One of our members Helvetas donates funds for the publication of the newsletter for two years.
February 1992	–	Decade Service participated at a meeting of NGOs convened by COWATER International and a visiting mission of the World Bank to discuss the setting up a Community Water Supply and Sanitation Programme Unit (CWSPU).

3.3 Activities of Sarvodaya Movement

District	1987/88/89 GWS - Well	1990 GWS - Well	1991 GWS - Well
1. Colombo	0 - 73	01 - 04	00 - 11
2. Gampaha	00 - 28	00 - 04	00 - 14
3. Kalutara	00 - 00	00 - 00	00 - 00
4. Kandy	00 - 00	02 - 20	03 - 11
5. Matale	32 - 18	00 - 30	01 - 45
6. Nuwara Eliya	00 - 00	10 - 00	15 - 09
7. Galle	01 - 84	01 - 08	01 - 52
8. Matara	04 - 60	02 - 23	03 - 63
9. Hambantota	00 - 31	00 - 15	00 - 00
10. Jaffna	00 - 00	02 - 23	03 - 63
11. Mannar	00 - 00	00 - 00	00 - 00
12. Vavunia	00 - 00	00 - 00	00 - 00
13. Mulativu	00 - 00	00 - 00	00 - 06
14. Batticaloa	00 - 00	00 - 00	00 - 00
15. Amparai	00 - 00	00 - 00	00 - 05
16. Trincomalee	00 - 00	00 - 00	00 - 15
17. Kurunegala	00 - 159	00 - 31	00 - 78
18. Puttalam	00 - 169	00 - 27	00 - 38
19. Anuradhapura	00 - 103	00 - 51	00 - 47
20. Polonnaruwa	00 - 07	00 - 11	00 - 19
21. Badulla	09 - 16	10 - 25	08 - 64
22. Moneragala	00 - 00	00 - 00	00 - 00
23. Ratnapura	04 - 35	03 - 40	01 - 26
24. Kegalle	02 - 22	03 - 06	07 - 00

GWS - Gravity Water Supply

4. DONOR FUNDED PROJECTS

4.1 A comprehensive list of Donor funded projects implemented and on-going are given below.

No	Project	A)Donor B)Nat. Agency	Funds and Terms	Remarks
1	Matale-Polannaruwa Districts Rural Water Supply and Sanitation	A) DANIDA B) NWSDB	Grant Rs 300 M	1980-87. Feasibility Study. Provision of wells, piped water and latrines. Health education. Rural.
2	Estate Water Supply and Sanitation	A) DANIDA	Loan Rs 5.0 M	Rural.
3	Harispattuwa Rural Water Supply and Sanitation	A) FINNIDA B) NWSDB	Grant FIM 58 M GSL Rs 23.5 M	1980-87. Provision of 1100 wells, piped water 100,000 people, 15,000 latrines and health education. Rural.
4	Kandy District Rural Water Supply and Sanitation	A) FINNIDA B) NWSDB	Grant FIM 72 M GSL Rs 64.0 M	1987-89. Feasibility Study. Provision of wells, piped water, latrines and health education. Rural.
5	Galagedera Ground Water Scheme	A) FINNIDA B) NWSDB	Grant Rs 4 M	1987. Provision of wells. Rural.
6	Kurunegala IRDP	A) IDA B) MinLGHC	Loan Rs 13 M	1979-85. Provision of 400 wells. Rural.
7	Puttalam IRDP	A) IDA B) MinLGHC	Total Rs 6.2 M Loan Rs 3.2 M	1987 onwards. Provision of wells. Rural.
8	Hambantota IRDP	A) NORAD B) MinPl	Grant Rs 19 M	1979 onwards. Provision of drilled and open wells and latrines. Rural.
9	Moneragala IRDP	A) NORAD B) MinPl	Grant Rs 10 M	1985 onwards. Provision of wells and latrines. Moneragala WSS Thanamalwila WSS.

No	Project	A)Donor B)Nat. Agency	Funds and Terms	Remarks
10	Sri Lanka Water Supply Sector Project	A) ADB B) NWSDB	Loan USD 30 M	1987-1993. Rehabilitation of piped urban water supply systems 30-40 nos. Urban.
11	Institutional Support	A) UNDP; WHO B) NWSDB	Grant USD 0.8M	1979-1988. Urban and rural.
12	Kurunegala Rural Water Supply	A) GTZ B) NWSDB	Grant DM 9.0M	1985-1988. Provision of wells and latrines. Rural.
13	Vavuniya-Mullaitivu District Water Supply	A) GTZ B) NWSDB	Grant DM 3.876M	1981-1988. Rehabilitation of piped systems, provision of wells. Beneficiaries at least 60% of population. Supporting the sanitation programme. Rural.
14	Estate Area Project	A) UNICEF B) JEDB and	Grant USD 1.9M GSL USD 7.7M	1984-1988. Provision of wells and latrines. Rural.
15	Mahaweli Systems H and B, Community Health Project	A) UNICEF B) Mahaweli Authority	Grant USD4.152M GSL USD 2.187M	1983-1988. Provision of wells and latrines. Rural.
16	Kalutara District Integrated Basic Services Project	A) UNICEF B) MinLGHC, et al.	Grant USD 3.0M GSL USD 3.6M	1984-1990. Provision of wells, piped systems and latrines. Rural
17	Anuradhapura District Integrated Basic Services Project	A) UNICEF B) MinLGHC, et al.	Grant USD 3.92M GSL USD 2.26M	1987-1991. Provision of wells and latrines. Rural.
18	Dry Zone Area Community Wells	A) UNICEF B) MinLGHC	Grant USD 0.88M GSL USD 1.535M	1982-1988. Rural.
19	Water Supply and Sanitation Sector Project	A) USAID B) NWSDB	Total USD 19.6M Grant USD 5.0M	1984-1988. Institutional Development and Strengthening of NWSDB. Six demonstration projects. Urban and rural.

No	Project	A)Donor B)Nat. Agency	Funds and Terms	Remarks
20	Southwest Coastal Area Project. Project I	A) IDA; CIDA; EEC B) NWSDB	Loan USD 21M	1977-84. Improvement to the water supply of Greater Colombo; Ambalangoda, Kahiterra and towns north of Colombo. Urban.
21	Southwest Coastal Area Project. Project II	A) IDA; Saudi Fund B) NWSDB	Total Rs 1630M Loan USD 30 Loan Riyal 99M	1980-85. Water Supply to Greater Colombo, transmission systems. Rehabilitation of Colombo sewerage. Urban
22	Trincomalee Water Supply, urban	A) France B) NWSDB	Total Rs 659M Loan Fr 112.5M	1980-1982. Water intake, raw water pipe, treatment plant, distr-ibution lines. Urban.
23	Badulla Urban Water Supply	A) France B) NWSDB	Total Rs 140M Loan Rf 15.0M	1987-1990. Intake, pumping station, treatment plant. Urban.
24	Kurunegala Urban Water Supply	A) France B) NWSDB	Loan and Grant Fr 14.72M	1980-1986. Pumping station and treatment Plant. Urban.
25	Kandy Urban Water Supply	A) France B) NWSDB	Total Rs 10.2M Loan Fr 1.5	1981-1982. Uprating the treatment plant from 3.5 mgd to 7.5 mgd provision of new raw water pumps. Urban.
26	Contribution to Water Resources Board	A) ODA - UK B) WRB	Grant Rs 2.0M	1987. Institutional Development. Rural.
27	Institutional Support	A) UNDP; WHO B) NWSDB	Grant USD 0.83M	1979-1983. Assistance in planning, designs, operations and mainte-nance, and manpower training. Urban and rural.
28	Community Water Supply and Sanitation	A) WHO B) NWSDB	Grant USD 0.42M	1986-1987, to be extended. Institutional support. Urban and rural.

No	Project	A)Donor B)Nat. Agency	Funds and Terms	Remarks
29	Training in Public health Engineering	A) WHO B) NWSDB	Grant USD 0.07	1986-1987, to be extended. Institutional development. Rural.
30	Matara IRDP	A) SIDA B) MinPl	Grant Rs 4.242M	1979 ongoing. Rural.
31	Mannar Group of Towns Water Supply	A) Nether-lands B) NWSDB	Total Rs 44M Grant Fl 2.0M	1978-1982. Improvements to the headworks and the distribution systems of the water supply of Mannar, Vankalai, Vidathaltivu, and Thivuketheswawra. Urban.
32	Matara Group of Towns	A) ODA - UK B) NWSDB	Total Rs 265 M Grant GBP 2.64M	1979-1983. Improvement and extension of urban water supplies of Matara, Devinuwara, Gandara Kottegoda and Dickwella. Urban.
33	Chilaw/Puttalam Water Supply Scheme	A) China B) NWSDB	Total Rs 386.00 Loan Rs 290.00	Urban.
34	Puttalam Urban Water Supply	A) China B) NWSDB	Total Rs 450.00 Loan Rs 375.00	Urban.
35	Third Sri Lanka Water Supply and Sanitation	A) IDA B) NWSDB	Loan USD 37M G&L USD 28M	1987-1991. Urban water supply and sewerage in Greater Colombo area. Urban.Ambatale Jubillee Maharagama transmission and Maharagama Water Supply
36	Nuwara Eliya District IRP	A) Netherland B) NWSDB		1981-1988. Rural.
37	Jaffana Peninsula Market Town Water Supply	A) USAID B) NWSDB	Total Rs 244M Loan USD 6.0M Grant USD 2.0M	1980-1984. Water intakes, ground water reservoirs, and trans-mission mains in Chavakachcheri. Urban.

No	Project	A)Donor B)Nat. Agency	Funds and Terms	Remarks
38	Water Distribution Systems Mapping, Greater Colombo	A) NORAD	Grant NOK 12.3M	1981-1984. Mapping Greater Colombo water distribution and sewerage systems. Urban.
39	Matale District IRDP	A) IDA B) MinLGHC	Total Rs 4.7M Loan Rs 2.6M	1980-1985. Provision of 100 protected wells. Rural.
40	Upgrading and construction of community wells	A) UNICEF B) MinLGHC; NWSDB	Total Rs 29.0M Loan USD 0.95	1979-1983. Upgrading and construction of 575 community wells, 100 school wells, 25 piped systems; drilling of 1000 deep wells. Establishing maintenance units and providing health education. Rural.
41	Consultancy services fund for design of Water Supply Schemes	A) SIDA B) NWSDB	Total Rs 10M Grant SEK 2.7M	Design of Arpam, Polgolla, Minuwangoda and Diwatalawa schemes. Rural.
42	Environmental health and community development in slums and shanties of Colombo	A) UNICEF B) Ministry of Health	Total Rs 24.0M Grant USD 2.7M	1979-1983. Provide safe water and convert 3200 bucket latrines to sanitary latrine, provide health education. Rural.
43	Environmental health and training	A) UNICEF B) Ministry of Health	Total Rs 21M Grant USD 0.44M	1979-1983. Provide 200,000 latrines, train 600 public health inspectors. Rural.
44	Negombo Water Supply Project I and II	A) France B) NWSDB	Total Rs 430M Loan Fr 35M Loan USD 2.753M	1980-1985.
45	Labugama Kalatuwawa	A) Japan B) NWSDB		1985-1986. Urban. Upgrading of Treatment plants at Labugama and Kaltuwawa.

No	Project	A)Donor B)Nat. Agency	Funds and Terms	Remarks
46	Kandy WSS	A) Japan B) NWSDB		1989-1991. Urban. Upgrading of Treatment plant and intake of Kandy WSS
47	Polonnaruwa	A) FR China B) NWSDB	Total Rs 99 M Loan Rs	1986-1989. Urban. Construction of 1.2 mgd Treatment plant storage towers and distribution system
48	Greater Colombo Water Supply Extension of Treatment Works	A) France B) NWSDB	Total Rs.2400M Loan Rs.1500M	1991-1993. Urban. Construction of a 40 mgd water treatment plant. Supply and installation of Intake pumps and Booster pumps
49	Greater Colombo Water Supply Treatment plant Rehabilitation - Ambatale Labugama Kalatuwawa	A) Japan B) NWSDB	Total Loan	1992-1993. Urban. Upgrading of treatment plants at Ambatale, Labugama and Kalatuwawa
50	Preparation of District Development Plans and Priority Investment plans Badulla, Matara & Ratnapura Districts	A) UNDP B) NWSDB	Total Grant	1991.
51	Establishment of community water and Sanitation programme unit	A) UNDP/IDA B) M/H&C	Total Grant	1991-1992.
52	Implementation of PIP for Badulla, Matara & Ratnapura	A) IDA B) CWSFU/ MH&C	Total USD 27.2M Loan	1992-2000.
53	Preparation of DDP for Kegalle Kalutara and Moneragala	A) ADB B) NWSDB	Total	1991.

No	Project	A)Donor B)Nat. Agency	Funds and Terms	Remarks
54	Preparation of DDP for Puttalam Kurunegala & Galle	A) CIDA B) NWSDB	Total Grant	1992.
55	Hill country water Supply Project. Water Supply to Badulla, Medadumbara and Hatton	A) UK Govt. B) NWSDB	Total Loan Grant	1989-1990. Construction of a 1 mgd water treatment plant at Meda Dumbara and 2 Nos. 0.5 mgd water treatment plants at Hatton. Construction of Transmission Gravity

4.2 The status of Foreign funding in rural water supply with respect to Districts is given in the Table below.

	District	Donors	Rs. Mill incl. GSL input	Rural Population 1981	Rs. per capita
1	Colombo			435,000	-
2	Gampaha			1,003,000	-
3	Kalutara	UNICEF	190	652,000	290
4	Kandy	FINNIDA	900	903,000	997
5	Matale	DANIDA; IDA	155	319,000	485
6	Nuwara Eliya	Netherlands	..	566,000	..
7	Galle			648,000	-
8	Matara	SIDA	4	573,000	7
9	Hambantota	NORAD	19	383,000	50
10	Jaffna + Kilinochchi			560,000	-
11	Kilinochchi			-	-
12	Mannar	IDA	2.6	92,000	28
13	Vavuniya	GTZ, IDA	35	77,000	481
14	Mullaitivu	GTZ	32	70,000	457
15	Batticaloa	UNICEF	45	251,000	179
16	Amparai			336,000	-
17	Trincomalee			173,000	-
18	Kurunegala	GTZ, UNICEF, IDA	317	1,668,000	271
19	Puttalam	IDA	6	431,000	14
20	Anuradhapura	UNICEF	253	547,000	463
21	Polonnaruwa	DANIDA, UNICEF	195	241,000	809
22	Badulla	IDA	14	589,000	24
23	Moneragala	NORAD	80	268,000	71
24	Ratnapura			738,000	-
25	Kegalle			632,000	-

NOTES

1. DANIDA-Project in Matale and Polonnaruwa and GTZ-Project in Vavuniya and Mullaitivu are divided as 50% in each district.

2. UNICEF-Project in Mahaweli systems "B" and "H" is divided between Batticaloa, Kurunegala, Anuradhapura and Polonnaruwa as 25% in each.

4.3 Piped and Gravity Water Supply Schemes Completed by Donors and Other Agencies 1981 - 1986

DONOR AND SCHEME DETAIL	PUMPED No.	PUMPED Pop. Served	GRAVITY No.	GRAVITY Pop. Served	TOTAL Pop. Served
FINNIDA					
Harispattuwa	-	128,000	35	2,200	130,200
DANIDA					
Matale+Polonnaruwa					
- Estate Schemes			47	22,860	22,860
- Village Schemes			7	2,440	2,440
UNICEF/Excluding NWSDB implemented					
Mahaweli	9	13,500			13,500
Kalutara	6	6,000			6,000
IRDP			40	10,000	10,000
SARVODAYA			25	25,000	25,000
TOTAL		147,500		62,500	210,000

Source : Sri Lanka Rural Water Supply & Sanitation Sector Study

4.4 Successful Water Supply Tube Wells and Hand Dug Wells Fitted with Handpumps 1981 – 1986

AGENCY	TUBE WELLS	SHALLOW WELLS	TOTAL WELLS	POP. SERVED (000) 120 per well
NWSDB	2902		2902	348.2
WRB	1035		1035	124.2
DANIDA	1110	32	1148	137.8
FINNIDA	206	823	1029	123.5
GTZ-FRG	183	Renova-tions	183	22.0
NORAD	280	–	280	33.6
Redd Barna	343	–	343	41.2
Sarvodaya		436	436	52.3
IRDP		650	650	78.0
UNICEF		1460	1460	175.2
Contractors/ Others	500	500	1000	120.0
TOTAL WELLS	6559	3907	10466	–
POPULATION SERVED (000)	787.1	466.9	–	1256.0

NOTES:

1. The NWSDB has been active in providing boreholes for IRDP and UNICEF funded projects.

2. The WRB has been active in providing tubewells for DDCs and the Mahaweli Development Agency with 50% of their successful boreholes assumed to be provided for water supply purposes and fitted with handpumps.

Source : Sri Lanka Rural Water Supply and Sanitation Sector Study

4.5 **The Table given below is an extract from the Rural Water Supply and Sanitation Sector Study done in 1986. This is being revised presently during the preparation of the district plans. This data is not goven as the data for many districts have not been finalised.**

		Wells as at 1985		Total wells needed by 1990		Additional wells to be constructed by 1990		
		Tube wells	Dug wells	Tube wells	Dug wells	Spring	Tube wells	Dug wells
1.	Amparai	334	1946	1014	1946	–	680	–
2.	Anuradhapura	1077	2465	1757	2719	–	680	254
3.	Badulla	12	3187	352	4219	103	340	929
4.	Batticaloa	–	2206	–	2875	–	–	669
5.	Colombo	2	3933	2	4751	–	–	818
6.	Galle	17	5263	17	6928	–	–	1665
7.	Gampaha	9	8774	9	11326	–	–	2552
8.	Hambantota	176	2339	516	3331	–	340	992
9.	Jaffna	–	5368	–	6237	–	–	869
10.	Kalutara	96	4631	1055	4631	–	959	–
11.	Kandy	11	7588	11	9690	210	–	1892
12.	Kegalle	225	4386	–	6442	205	–	1851
13.	Kurunegala	17	9335	905	11445	–	680	2110
14.	Mannar	29	862	29	991	–	–	129
15.	Matale	62	2071	619	2071	–	557	–
16.	Matara	–	4262	–	6150	–	–	1888
17.	Moneragala	375	879	1078	879	–	703	–
18.	Mullaitivu	200	204	200	404	–	–	200
19.	Nuwara Eliya	2	1077	2	1884	88	–	719
20.	Polonnaruwa	7	2071	620	2074	–	613	–
21.	Puttalam	60	3591	60	4651	–	–	1060
22.	Ratnapura	426	3457	1106	4997	154	680	1386
23.	Trincomalee	12	1319	12	1918	–	–	599
24.	Vavuniya	400	–	400	184	–	–	184
	TOTAL	3532	81217	9764	102743	760	6232	20766

Soruce : Project National Training Delivery System for Rural Water Supply and Saniation in Sri Lanka "Towards Human Resources Development Planning for Rural Water Supply and Sanitation.

4.6 A comprehensive list of on going water supply and sanitation projects in Sri Lanka is presented in Appendix 3.

A summary giving the status of DDP's and PIP's in Sri Lanka are given in the following pages.

SUMMARY

Rural Water Supply and Sanitation Planning Status by District
District Development Projects and Priority Investment Plans

District	DDP	PIP	Agency	Implementation
Ampara	-	-	-	-
Anuradhapura	In Progress	In Progress	DANIDA	DANIDA
Badulla	Completed (91)	Completed (92)	UNDP	GOSL
Batticaloa	-	-	-	-
Colombo	-	-	-	-
Galle	In Progress	In Progress	CIDA/Cowater/GOSL	GOSL
Gampaha	-	-	-	-
Hambantota	Completed (86) but inadequate	-	IRDP/NORAD	IRDP
Jaffna	-	-	-	-
Kalutara	Completed (91)	In Progress	ADB	GOSL
Kandy	Completed (91) but inadequate	-	FINNIDA	FINNIDA
Kegalle	Completed (91)	In Progress	ADB	GOSL
Kilinochchi	-	-	-	-
Kurunegala	In Progress	In Progress	CIDA/Cowater/GOSL	GOSL
Mannar	-	-	-	-
Matale	Completed (83) Out dated	-	DANIDA	DANIDA
Matara	Completed (91)	Completed (92)	UNDP	GOSL
Moneragala	Completed (91)	In Progress	ADB	GOSL
Mullaittivu	-	-	-	-
Nuwara Eliya	-	-	-	-
Puttalam	In Progress	In Progress	CIDA/Cowater/GOSL	GOSL
Polonnaruwa	Completed (83) Out dated	-	DANIDA	DANIDA
Ratnapura	Completed(91)	Completed (92)	UNDP	GOSL
Trincomalee	-	-	-	-
Vavuniya	-	-	GTZ	-

5. COLLECTION OF DATA ON WATER BORNE DISEASES IN SELECTED DISTRICTS INCLUDING ESTATE SECTOR AND REFUGEES

The last national census in Sri Lanka was carried out in 1981. Since then it has not been possible to have a national census due to various social problems that exist in some districts.

The population data based on the 1971 and 1981 National Census and the projected population for 1992 has been obtained from this data.

5.1 Population data - districts

Extracted from the report of the Dept. of Census and Statistics
(1992 figures have been projected from these figures)

District	Population 1971	Average Annual Rates of Growth 1971-1981	Population 1981	Population 1992
1. Colombo	1,498,393	1.3	1,698,322	1,927,011
2. Gampaha,	1,173,872	1.8	1,389,490	1,647,962
3. Kalutara	729,514	1.4	827,189	940,242
4. Kandy	1,996,737	0.3	1,126,296	1,089,479
5. Matale	314,841	1.4	357,441	499,867
6. Nuwara Eliya	541,466	0.3	522,219	669,970
7. Galle	735,173	1.1	814,579	893,889
8. Matara	586,443	1.0	644,231	705,589
9. Hambantota	340,254	2.4	424,102	526,186
10. Jaffna	696 664	1.9	831,112	990,024
11. Mannar	74,125	3.9	106,940	138,105
12. Vavunia	60,212	5.1	95,904	151,730
13. Mulativu	43,625	6.3	77,512	154,379
14. Batticaloa	256,721	2.7	330,899	425,052
15. Amparai	272,605	3.8	388,786	501,771
16. Trincomalee	188,245	3.3	256,790	323,651
17. Kurunegala	1,025,633	1.8	1,212,755	1,441,347
18. Puttalam	378,430	2.9	493,344	606,636
19. Anuradhapura	388,770	4.5	587,822	787,088
20. Polonnaruwa	163,653	5.1	262,753	392,344
21. Badulla	615,405	0.5	642,853	667,521
22. Moneragala	193,020	4.0	279,743	354,120
23. Ratnapura	673,558	1.8	796,468	920,616
24. Kegalle	642,538	0.6	682,411	730,150
Total	12,689,897		14,850,002	17,384,729

The 1981 Census has been analysed by the Department of Census and Statistics based on 10 percent sample and produced as Housing Tables. The data from these tables are summarised and produced below in two tables to indicate the Distribution of Housing units by main source of drinking water.

5.2 Occupied Housing Units by Main Source of Drinking Water

(Data projected to 1992 Values)

Main Source of Drinking Water	No of Housing Units
1. Piped Water	
Within premises	322,604
Outside premises	375,946
2. Protected Well	
Within premises	1,042,150
Outside premises	1,070,533
3. Unprotected well	838,448
4. River, Tank other source	284,929
5. Unspecified	105,380
Total	4,039,990

5.3 Percentage distribution of housing units by main source of drinking water by Type and Location (Data projected to 1992 values)

Source	All Sectors	Urban Sector	Rural Sector	Estate Sector
Piped water on tap				
Within premises	8.0	24.4	1.8	28.8
Outside premises	9.3	22.1	3.3	36.8
* Protected Well				
Within premises	25.8	27.7	26.7	12.6
Outside premises	26.5	16.1	31.4	3.7
Unprotected Well	20.8	4.9	26.4	4.1
River, tank or other	7.0	1.1	8.5	5.8
Not stated	2.7	3.7	1.9	8.1
Total	100.0	100.0	100.0	100.0

* Including Hand Pump Wells

The percentage of occupied houses by type and main source of drinking water for individual districts obtained from the Housing tables based on the 1981 Census are as given below.

5.4 **Percentage of Occupied Housing Units By Type and Main Source of drinking water (Based on Census of Population & Housing Sri Lanka 1981 - Housing Tables)**

	Piped Water		Protected Well				
	Within Premises	Outside Premises	Within Premises	Outside Premises	Unprotected Wells	Rivers Tank & other Sources	Not Stated
All Districts	8.0%	9.3%	25.8%	26.5%	20.8%	7.0%	2.7%
Colombo	31.1%	19.4%	26.3%	12.2%	7.6%	0.6%	2.8%
Gampaha	4.3%	4.4%	43.1%	22.5%	22.0%	0.5%	3.2%
Kalutara	2.9%	2.0%	32.3%	27.4%	28.5%	3.7%	3.2%
Kandy	13.9%	15.0%	12.7%	30.4%	19.7%	6.0%	2.2%
Matale	6.1%	7.7%	12.7%	33.7%	24.6%	13.0%	2.2%
Nuwara Eliya	19.2%	45.9%	4.1%	6.8%	6.5%	9.2%	8.4%
Galle	1.9%	3.8%	32.9%	28.8%	27.6%	3.0%	1.9%
Matara	5.1%	4.9%	26.1%	21.4%	36.1%	4.8%	1.7%
Hambantota	2.4%	8.7%	13.0%	28.2%	30.4%	16.2%	1.1%
Jaffna	2.9%	7.8%	38.8%	38.3%	8.0%	1.8%	2.5%
Mannar	3.2%	18.3%	14.3%	55.8%	5.7%	2.2%	0.6%
Vavuniya	0.7%	2.8%	37.0%	37.6%	13.4%	3.4%	5.1%
Mullaitivu	0.5%	2.8%	30.7%	29.7%	27.4%	6.3%	2.6%
Batticaloa	1.0%	2.7%	43.8%	31.9%	9.4%	9.2%	1.9%
Amparai	3.5%	3.8%	36.0%	25.4%	13.9%	11.9%	5.5%
Trincomalee	1.4%	3.4%	30.0%	33.3%	18.5%	10.5%	2.9%
Kurunegala	6.9%	1.1%	29.1%	35.5%	26.8%	4.5%	3.0%
Puttalam	2.7%	4.0%	34.7%	33.1%	18.7%	5.0%	1.7%
Anuradhapura	3.1%	4.0%	14.6%	45.4%	23.4%	7.7%	2.0%
Polonnaruwa	0.8%	1.1%	23.2%	24.5%	40.8%	8.6%	1.2%
Badulla	14.9%	28.6%	8.1%	16.0%	14.8%	13.7%	3.9%
Moneragala	2.9%	2.7%	12.6%	22.0%	29.7%	28.9%	1.1%
Ratnapura	9.2%	10.0%	12.8%	21.3%	21.8%	22.8%	2.1%
Kegalle	6.2%	3.7%	25.4%	25.0%	28.7%	7.5%	2.6%
All Sectors	8.8%	9.8%	26.8%	25.9%	20.1%	6.4%	2.1%
Urban Sector	27.2%	23.4%	26.9%	15.0%	4.1%	1.0%	2.4%
Rural Sector	1.9%	3.4%	28.0%	31.0%	26.1%	8.0%	1.5%
Estate Sector	28.7%	37.1%	12.7%	3.6%	4.1%	5.7%	8.2%

5.5 Main Sources of drinking water (Rural areas) in selected Districts

A recent study carried out in the Districts of Matara, Badulla, Ratnapura, Kegalle, Moneragala, Kalutara gives the following results with respect to various types of sources used by the population in these districts are given below.

This information compares somewhat favourably with that what has been found from the National Census.

S O U R C E S

Districts	Protected Well	Unprotected Well	River/ Stream /lake	Spring	Gravity System	Piped System	Roof catchment other
Matara	31.1%	33.8%	15.2%	4.2%	2.5%	13.2%	-
Badulla	5.6%	9.0%	20.1%	54.0%	10.0%	1.3%	-
Ratnapura	19.4%	31.0%	27.1%	10.3%	7.2%	1.7%	3.3%
Kegalle	36.4%	37.0%	5.0%	0.7%	11.2%	0.7%	9.0%
Moneragala	24.2%	46.0%	22.6%	-	-	1.2%	6.0%
Kalutara	55.3%	34.0%	3.8%	-	-	4.2%	2.4%

5.6 Distance to Source of Drinking

The distance of the source of Drinking water for the Districts of Kalutara, Moneragala and Kegalle are as follows.

(Percentage of Population in selected districts)

Distance from house	Wet Season	Dry Season	District
Within premises	50.4	52.2	KALUTARA
less than 100 m	32.4	28.4	
100 - 500 m	13.7	13.3	
More than 500 m	3.2	6.0	
Within premises	34.5	24.1	MONERAGALA
less than 100 m	42.8	42.7	
100 - 500 m	14.6	19.1	
More than 500 m	8.1	14.2	
Within premises	36.5	29.5	KEGALLE
less than 100 m	49.4	44.3	
100 - 500 m	13.3	22.8	
More than 500 m	0.8	3.8	

5.7 Resident population in Estates

The resident population in estates in the various districts are given in the table below. These numbers are already included in total figures reproduced earlier.

(Extracted from Table 1 - Census of agriculture - 1982 - Dept. of Census and Statistics)

District	Population
1. Colombo	9,150
2. Gampaha	6,074
3. Kalutara	31,925
4. Kandy	102,110
5. Matale	28,902
6. Nuwara Eliya	212,679
7. Galle	18,949
8. Matara	17,041
9. Hambantota	1,603
10. Jaffna	863
11. Mannar	661
12. Vavunia	95
13. Mulativu	390
14. Batticaloa	582
15. Amparai	222
16. Trincomalee	4,218
17. Kurunegala	22,117
18. Puttalam	7,892
19. Anuradhapura	1,700
20. Polonnaruwa	1,939
21. Badulla	148,323
22. Moneragala	7,031
23. Ratnapura	91,924
24. Kegalle	61,115
Total	776,487

5.8 Refugees and displaced persons in camps and in areas outside as at February 1992)

The refugees and displaced persons in camps and in areas outside as at February 1992 is reproduced below.

(Source : Ministry of Rehabilitation and Reconstruction)

District	Camps	No. of Families	No. of Persons
1. Jaffna	257	66,660	221,980
2. Mullaitivu	25	9,951	27,242
3. Mannar	03	12,954	50,026
4. Killinochchi	10	7,659	29,722
5. Vavunia	03	4,406	17,819
6. Batticaloa	33	20,027	80,963
7. Amparai/Kalmunai	25	7,451	22,138
8. Trincomalee/ Kantale	12	9,784	40,796
9. Influx areas			
Puttalam	66	7,800	39,000
Colombo	11	2,893	13,199
Kurunegala	28	1,680	7,148
Anuradhapura	54	5,338	30,603
Polonnaruwa	11	1,154	5,279
Matale	04	608	3,704
Other districts	-	4,303	20,858
Total	542	162,698	610,476

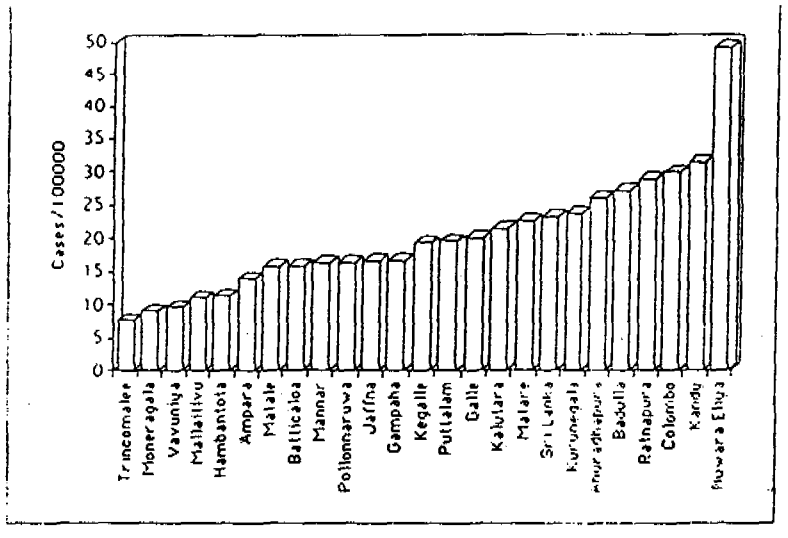
5.9 List of Water and Sanitation related diseases in Sri Lanka

The table below indicates what is meant by water and sanitation diseases in Sri Lanka

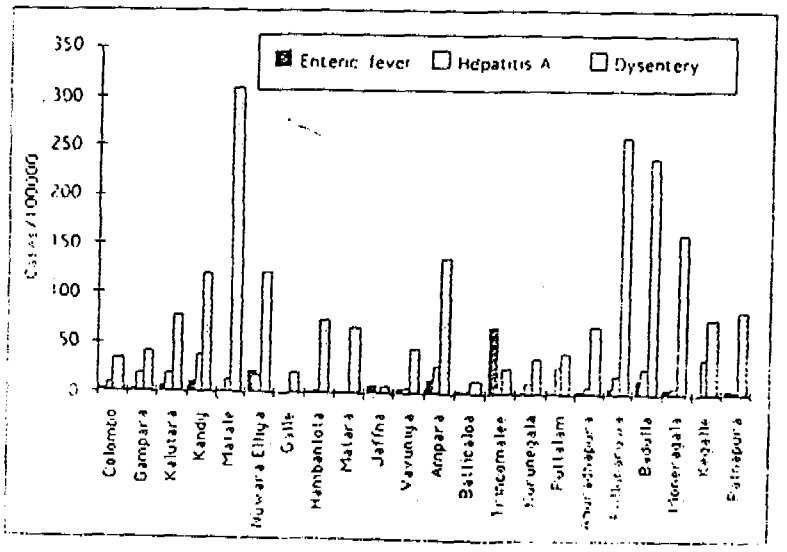
Problem	Strategies for Control			
Foecal oral (Water-borne/Water washed)	Behavioural change	Public Health Engineer-ing	Immu-nisa-tion	Specific medical treat-ment
Amebic Dysentery	Yes	Yes	No	Yes
Cholera	Yes	Yes	(Yes)	Yes
E. Coli Diarrhoea	Yes	Yes	No	Yes
Giardiasis	Yes	Yes	No	Yes
Rotavirus diarrhoea	No	No	Exp	No
Salmonellosis	Yes	Yes	(Yes)	Yes
Bacillary dysentery	Yes	Yes	No	Yes
Enteric fevers				
Typhoid	Yes	Yes	(Yes)	Yes
Paratyphoid	Yes	Yes	(Yes)	Yes
Poliomyelitis	(Yes)	Yes	Yes	No
Hepatitis A	Yes	Yes	No	No
Leptospirosis	Yes	Yes	No	Yes
Roundworm	Yes	Yes	No	Yes
Whipworm	Yes	Yes	No	Yes
Threadworm				
Water Washed				
Skin & eye infections	Yes	< water aval & used	No	(Yes)
Scabies	Yes		No	Yes
Water based		No		
Hookworm(humid soil)	Yes		No	Yes
Water related (insect vectors)		Yes		
Filariasis	Yes		No	(Yes)
Malaria	Yes	Yes	No	Yes
Dengue fever	Yes	Yes	No	No
Japanese Encephalitis	Yes	Yes Yes	Yes	No

5.10 Incidence of Water Related Diseases

The incidence of water borne and related diseases Districtwise for the period 1986-1990 are presented in tabular form. Further the infant mortality rate according to Districts and water and sanitaion related diseases according to district (1990) and the details for the estate sector are alsow given below.



- Infant Mortality rate according to district



- Water and sanitation related notifiable diseases according to district (1990)

SOURCE ANURADHAPURA DISTRICT PLAN INCEPTION REPORT

Incidence of water Borne
Diseases of Sri Lanka (SHIGELLOSIS)
Including Bacteriological Dysentry.

	1986	1987	1988	1989	1990
Colombo	2432	1969	2987	2605	2637
Gampaha	555	573	1727	1374	997
Kalutara	N/A	354	2175	1355	1531
Kandy	2526	408	2495	1396	2570
Matale	709	990	919	1056	2376
Nuwara Eliya	805	1062	683	1237	1297
Galle	422	601	577	727	650
Matara	1288	628	5115	787	1565
Hambantota	N/A	702	1035	1112	1379
Kurunegala	2260	2538	1670	1337	2118
Puttlum	1291	1133	686	851	740
Anuradhapura	187	1107	705	1029	1193
Polonnaruwa	N/A	N/A	356	521	1095
Badulla	674	1306	1690	1653	2306
Monaragala	508	1281	1546	2232	1863
Ratnapura	809	2118	3443	2897	1891
Kegalle	2044	2173	2001	221	225
Jaffna	120	493	791	N/A	N/A
Vavunia	122	215	362	N/A	N/A
Baticaloa	729	769	999	N/A	N/A
Ampara	535	1257	889	N/A	N/A
Trincomalee	237	186	298	N/A	N/A

Incidence of water Borne
****
Diseases of Sri Lanka (TYPHOID & PARATYPHOID)
****

	1986	1987	1988	1989	1990
Colombo	1210	767	700	526	578
Gampaha	251	268	248	115	94
Kalutara	253	238	224	85	253
Kandy	1103	1043	730	402	645
Matale	492	447	120	73	174
Nuwara Kliya	493	579	175	280	372
Galle	189	99	60	93	42
Matara	703	101	202	265	366
Hambantota	N/A	177	119	47	22
Kurunegala	305	393	150	139	228
Puttlum	208	124	93	76	49
Anuradhapura	401	216	247	181	854
Polonnaruwa	N/A	N/A	103	65	58
Badulla	525	545	606	375	558
Monaragala	667	553	516	460	475
Ratnapura	493	678	557	238	250
Kegalle	363	825	429	345	187
Jaffna	453	491	226	N/A	N/A
Vavunia	75	150	95	N/A	N/A
Baticaloa	274	140	140	N/A	N/A
Ampara	157	257	216	N/A	N/A
Trincomalee	227	706	777	N/A	N/A

Incidence of water Borne
****
Diseases of Sri Lanka (VIRAL HEPATITIS)
****

	1986	1987	1988	1989	1990
Colombo	640	1523	1144	776	1003
Gampaha	1610	1920	1744	531	632
Kalutara	363	454	334	312	381
Kandy	652	1026	869	353	1168
Matale	372	346	169	98	02
Nuwara Eliya	243	403	254	178	01
Galle	126	117	136	26	-
Matara	580	68	115	162	01
Hambantota	N/A	129	49	40	-
Kurunegala	737	598	521	240	478
Puttlum	356	432	338	377	397
Anuradhapura	427	427	168	429	231
Polonnaruwa	N/A	N/A	07	106	92
Badulla	270	329	224	347	407
Monaragala	209	263	14	223	125
Ratnapura	132	263	161	411	161
Kegalle	629	848	28	422	296
Jaffna	259	363	133	224	N/A
Vavunia	63	233	253	284	N/A
Batticaloa	414	355	11	155	N/A
Ampara	276	259	77	193	N/A
Trincomalee	737	83	36	59	N/A

Incidence of water Borne
****
Diseases of Sri Lanka (AMOEBIASIS)
****

	1986	1987	1988	1989	1990
Colombo	306	228	194	249	186
Gampaha	389	101	166	174	31
Kalutara	305	128	56	54	119
Kandy	1102	556	342	165	156
Matale	740	255	191	98	43
Nuwara Eliya	510	101	86	84	82
Galle	1564	98	64	38	17
Matara	800	08	47	16	20
Hambantota	N/A	57	07	10	01
Kurunegala	371	69	66	39	208
Puttlum	204	31	37	50	244
Anuradhapura	557	29	168	13	95
Polonnaruwa	N/A	N/A	07	10	11
Badulla	813	151	224	46	198
Monaragala	473	34	14	04	41
Ratnapura	587	110	161	91	615
Kegalle	264	30	28	70	104
Jaffna	320	155	133	N/A	N/A
Vavunia	133	58	253	N/A	N/A
Baticaloa	136	133	11	N/A	N/A
Ampara	312	127	77	N/A	N/A
Trincomalee	32	08	36	N/A	N/A

Incidence of Water Borne Diseases in the Estate Sector
1981 - 1990

Year / Disease	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Dysentery	41,126	33,645	26,164	14,672	5,355	4,576	3,810	2,190	2,378	2,414
Simple contied fever	1,538	1,745	1,375	1,270	1,139	826	599	141	183	254
Cholera	n/a	n/a	n/a	n/a	n/a	0	0	0	0	0
Malaria	578	365	502	379	458	245	583	120	122	137
Poliomyelitis	n/a	n/a	n/a	n/a	n/a	0	0	0	0	0
Diarrhoea	90,972	86,242	52,028	36,163	36,519	36,518	28,704	18,628	14,591	15,205
Viral Hepatitis	73	69	79	57	42	27	48	63	21	11
Enteric fever	162	176	159	202	174	188	43	14	3	42

Incidence of Diarrhoeal Diseases in SLSPC Estates
1982 - 1990

Year	1982	1983	1984	1985	1986	1987	1988	1989	1990
Diarrhoea	43,024	40,787	24,606	17,103	17,271	13,575	8,810	6,901	7,191
Dysentery	15,912	12,374	6,939	2,533	2,136	1,802	1,031	1,125	1,142
Total	58,936	53,161	31,545	19,636	17,010	15,377	9,841	8,026	8,333
Deaths	142	152	69	44	38	26	4	n/a	n/a

The main reasons for the reduced incidence are attributed to better water/sanitation schemes, health education and use of oral rehydration salts.

It was found that these is no adequate statistics are available on the incidence of water borne diseases in the refugee sector.

6. IDENTIFICATION OF NEEDS FOR WATER SUPPLY IN THE VARIOUS DISTRICTS IN SRI LANKA

6.1 Existing piped water supply schemes in Sri Lanka

These are over 500 rural and urban piped water supply schemes presently operational in Sri Lanka and the list of water supply schemes is appended in Appendix 4.

6.2 Deep wells

The Deep well programme in Sri Lanka envisages that 20,000 deep wells will be drilled by 1995. At present the number of deep wells drilled is around 12,000.

The list of deep wells constructed by NWSDB is given in Page S7

6.3 Shallow Wells

Though it is not possible to give the exact number of wells in each district the following numbers in the Districts of Kalutara, Kegalle and Moneragala indicate the magnitude of wells present in these districts.

No. of Wells in selected districts

Districts	Total No.of dug wells	Protected wells	Unprotected Wells	Tube Wells
Kalutara	56,700	33,500	23,200	457
Moneragala	16,200	3,200	13,000	522
Kegalle	36,300	17,000	19,300	589

6.4 Need for improved Water Supply

Though the coverage in water supply based on the Housing Table (See Table ..) indicates a lower percentage of persons obtaining water from unprotected wells in Nuwara Eliya District. The incidence water and sanitation related diseases appear to be quite high. Further though a high percentage of population have access to piped water supply (65.2%) The piped water supply in the Nuwara Eliya District

GROUND WATER PROJECT - CONSTRUCTION OF HAND PUMP WELLS
1980 - END OF APRIL 1992

DISTRICT	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	UPTO END OF APR'92	TOTAL
ANURADHAPURA	13	13	60	152	372	113	104	345	266	127	40	69	24	1698
													+ *13	+ *13
KURUNEGALA	0	0	0	55	26	27	141	102	57	25	19	24	7	483
														+ *52
PUTTALAM	26	10	0	0	0	0	0	12	98	1	4	0	0	151
														+ *62
MANNAR	4	13	1	0	0	0	0	0	0	0	0	0	0	18
MATALE	0	0	42	1	0	0	52	3	4	0	1	0	0	103
TRINCOMALEE	0	0	0	0	7	8	35	0	0	11	0	0	0	61
POLONNARUWA	0	0	0	0	2	24	152	5	0	0	3	3	0	189
KANDY	0	0	0	0	0	14	2	35	20	37	22	8	6	134
													+ *1	+ *1
AMPARA	0	0	3	91	98	42	49	0	19	1	13	0	0	316
BADULLA	0	0	0	0	0	9	45	12	13	105	8	22	0	214
BATTICALOA	0	0	0	0	0	0	3	0	0	0	0	0	0	3
HAMBANTOTA	39	0	2	0	1	60	74	77	11	0	9	4	0	277
													+ *6	+ *462
MONARAGALA	3	48	175	19	6	32	34	159	39	7	4	16	47	589
RATNAPURA	0	0	0	0	0	312	65	27	63	24	6	1	2	500
MATARA	0	0	0	0	0	5	14	8	9	0	1	34	0	71
KALUTARA	0	0	0	0	0	115	49	132	66	114	27	30	7	540
GALLE	0	0	0	0	0	4	2	0	3	0	0	1	0	10
GAMPAHA	0	0	0	0	0	2	17	5	2	1	5	4	3	39
COLOMBO	0	0	0	0	0	0	2	2	0	0	1	1	0	6
NUWARAELIYA	0	0	0	0	0	2	0	0	0	0	0	0	0	2
KEGALLE	0	0	0	0	0	0	0	8	3	7	3	0	3	22
VAVUNIYA	0	0	0	0	0	0	0	0	0	0	1	0	0	1
TOTAL	85	84	283	318	512	769	840	922	673	460	166	217	98	5427
													+ *20	(+*59)

NOTE : * NO. OF HAND PUMPS INSTALLED FOR WELLS DONE BY WATER RESOURCES BOARD.

is necessarily from the unprotected spring sources and do not provide safe drinking water. Most of these piped schemes are in estates and the sources are unprotected.

Matale District has a high percentage using unprotected wells (24.6%). The water and sanitation related diseases in the Matale District appear to be the highest.

The Donor activities that have taken place in these two districts are limited ie. Nuwara Eliya District - Netherlands Government and Matale District DANIDA and IDA. These projects have now been completed.

The other districts where the need for improved water supply exists are Badulla (high percentage of unprotected spring intakes and unprotected wells) Moneragala (unprotected wells - 29.7%). Anuradhapura (unprotected wells - 40.8%) Galle (unprotected wells - 36.1%) Hambantota (unprotected wells 30.4%) Kalutara unprotected wells 28.5% Kegalle unprotected wells 28.7%.

Anuradhapura District is being presently funded by DANIDA, Badulla and Matara are being funded by IDA and it is possible that Kalutara, Kegalle and Moneragala will most probably be taken up by ADB. The DDP's and PIP's are being prepared for Galle and on completion will most probably be taken up by a foreign agency. There is heavy IRDP involvement in the Hambantota District. Hence at present there is no foreign agency active in Matale District. In the Nuwara Eliya District also there is no foreign agency actively involved. There is some involvement in the estate sector by JEDB/SLSPC Netherlands Government in these two Districts. However this is considered to be inadequate and leaves much room for involvement of a new agency to embark on a new project.

7. IDENTIFICATION OF PROBABLE DISTRICTS FOR THE INVOLVEMENT OF ITDG

7.1 Probable Areas for ITDG Involvement

There are several areas in which ITDG can get involved in the rural water supply programme. They can be classified as

i) Geographically defined areas - to go on district basis and involving in districts where service levels are very low and improvement inputs over the past years have been minimal;

ii) Bacteriological quality of rural community drinking water - 60% to 70% of rural community's drinking water source is the hand dug well. Studies reveal that irrespective of the sophistication of protection the faecal contamination level is very high in 90% of these wells. Involvement to offer remedies to this state of affairs is an urgent need but the number of wells are so numerous, providing alternatives will involve enormous costs and also incite less community interest. The ideal would be to retain prevailing system and look for improvements to prevent contamination.

iii) Improvements to chemically affected sources - many studies by several agencies disclose another aspect of water quality in unison; the unsuitable chemical quality of water in most sources. Such effects are due to salinity, hardness, presence of fluoride, Iron and Manganese. In addition there is the ever increasing problem of chemical pollution of the environment as a result poor effluent disposal methods used almost every where. Involvement is possible in order to improve this present situation.

iv) Health education and institutional development - another primary factor highlighted by all parties involved in the water supply studies is the need for health education and institutional development. Health education is vital to establish and retain such systems and practices that prevent contamination, pollution, misuse, abuse and excessive use, of water sources. Causes for poor quality are necessarily due to human actions. These are obviously of recent origin. The institutional development desired is the establishment of a community organisation for monitoring and control of activities connected with water sources in order sustain the quality of water.

v) There is an increasing demand for rural water supply and sanitation probably as a result of realisation of health-economic benefits to the community from such facilities. It seems financing for such facilities prove too heavy a burden of Governments and Financing Institutions besides the negative effects seen from the investments already made. yet the responsibility for planning and providing such facilities lie with the Government and the Financing Institutions. Studies in these aspects in recent times have indicated that projects implemented with community participation have proved very successful in comparison to previously implemented top-down service programmes. The evidence suggests that there is both a willingness and ability to pay for improved services by the communities in the rural areas.

Assessing community preferences is one of the most significant aspects of rural water supply systems. Unless the community participates actively in the selection of service levels, technology and in decisions associated with how and why of cost recovery, the sustainability and success of any such system will be doubtful. The important aspect is making the community responsible for the service facilities and accepting the ownership of the facilities.

As primary providers of water supply, women are also the primary beneficiaries of any improvements. The significance of the role of women in water supply and sanitation has now been established. It is the time and efforts of the women that matters most with regard to household water supply and sanitation. It is the responsibility of the women for fetching most of the water for the household. Besides, women look in to the discharge of childrens' faeces and attend to their washing: the sanitation aspect. Her role in the rural household in water and sanitation is of extreme importance and the involvement of women in any rural water supply and sanitation programme is a vital element.

The women in rural societies have responded well to this call to participate in developing and sustaining rural water and sanitation programmes. Their active participation can be mobilised with the right approach. The engagement of women professional social workers for this is purpose is an absolute need as the rural women tend to withdraw, from such activities otherwise. For any rural water and sanitation project health education is a principle factor that should precede the programme and then continued after implementation until benefits from impact evaluations are realized.

7.2 Selected Districts for ITDG Involvement

The foregoing indicates that there is a possibility for ITDG involvement in the Matale and Nuwara Eliya Districts. (See Section 6.4).

This also carries an advantage that these two districts are located fairly close to each other.

Therefore the districts selected for ITDG involvement are

1. Nuwara Eliya District

2. Matale District

However at this stage it is not recommended that ITDG should get involved at a macro level encompassing the whole districts mentioned above. Rather the ITDG should concentrate on smaller and more manageable communities in the region of 1000 persons or say 200 families.

In this context it is of opinion small estate communities presently not supplied with adequate drinking water (both with respect to quantity and quality) should be selected.

It is felt that this selection is quite justifiable with respect to these two districts which have a predominant estate population.

Further ITDG at present works closely with the estate sector in many projects. The Mini-Hydro project is one such example. Therefore it is felt that making inroads. into the estate sector in this field ie. water supply and sanitation is a very valid recommendation at this stage.

Depending on the success achieved at the pilot scale level a further project could be formulated to include several other rural communities not necessarily in the plantation sector.

However a review of the impact of the present pilot scale project will have to be carried out prior to deciding on which direction future projects should proceed.

Anyhow fundings in this project are certain to have a big impact on various other projects likely to be implemented in the near future. Namely the implementation of District Development Plans.

It would be also prudent to seek how such schemes could be implemented by refugees or refugee camps. However this aspect has to be considered in detail after obtaining more information such as locations of the camps, water resources in these areas present methods of obtaining drinking water, sanitation alternatives and incidence of water related diseases in these camps.

8. IDENTIFICATION OF PROJECTS FOR SPONSORSHIP BY ITDG

Under section 7 in addition to the Districts of possible involvement by the ITDG the nature of possible involvement has already been mentioned. The most important of these are namely.

a) Improvement of Bacteriological quality

b) Improvement of Chemical quality

c) Health education and institutional Development

Thus a clear policy of involvement for the ITDG could emerges from the above.

This could be basically listed as follows.

A) Spring sources

a) Where the Bacteriological quality is inadequate - provision of spring protection

b) Where the chemical quality is inadequate provision of water treatment such as roughing filtration, slow sand filtration or any other method of appropriate treatment.

B) Well Sources

a) Where Bacteriological quality is inadequate - Provision of well protection measures such as provision of aprons for the wells and improvements on the methods of abstraction as a measure to prevent pollution.

b) Where chemical quality is inadequate provision of low cost treatment methods such as iron removal plants or sand filters.

C) Deep Well Sources

Improvement of chemical quality by provision of low cost treatment methods such as iron treatment plant.

D) Inadequate Sources

Where the communities do not have adequate sources and have to walk long distances to obtain their drinking water methods should be explored to provide new sources of water conforming to drinking water norms. In this context it is not envisaged that complex water supply

schemes would be developed consisting of long gravity or pumping mains and mechanised pumps.

The proposed sources would be in the form of open protected dug wells or protected springs and in areas which these are not feasible rainwater collection or artificial recharge of rainwater methods could be adopted. However this will largely dependent on the pilot area selected for study.

E) Sanitation

It should be borne in mind that no water supply programme will be complete without an adequate sanitation programme to supplement it. Therefore in the event of ITDG deciding to embark on a pilot project a sanitation component will also have to be allowed for in this project. Only when water supply and sanitation is combined in any project will the impact of such a project will be felt in the community.

F) Health Education

The behavioural aspects of the target community should be improved by an intense programme of Health Education given intermittently at regular intervals throughout the period of project implementation. In this context it would be prudent to enlist the services of the Family Health Worker of the area on payment of a small allowance.

In this context a greater emphasis should be given to women's participation in this progress as this is an important method to disseminate information within the family.

G) Community Participation

In the implementation of the projects with ITDG sponsorship it is not envisaged that a "Top Down" approach will be adopted in the implementation of this project. Rather a "Bottom up" should be adopted.

In this context it will be necessary to mobilize each community selected by employing a social scientist who will not only mobilize the community prior to implementation of the project but will also assist in improving the behavioural aspects of the community.

This approach it is felt will also lead to the long term sustainability of the project that is to be implemented.

Project Benefits

It is envisaged that the following project benefits will result from the implementation of such a project.

a) Sense of feeling among the community that the hardware of the project implemented belongs to them thereby leading to long term sustainability of the scheme.

b) Improved health and sanitation in the target community due to the reduction of water related diseases.

c) Reduction of time spent on collection of water especially by women.

d) Reduction of Labour involved in the collection of water ie. walking and drawing of water.

e) Reduction in time lost on gainful employment due to the health.

f) Availability of additional time especially for women folk to engage in household economic activities thereby generating additional sources of income.

g) Availability of additional time to cater for the needs of the family.

h) Increased availability of time for leisure and social activities.

1. COST ESTIMATES FOR PLOT PROJECT

It is suggested that about 3-4 communities should be selected for the purpose of the pilot studies and the duration of the study will extend from 3 - 6 months.

Bearing this in mind the following costs to be incurred have been arrived at.

		Rs.
1.	Preliminary work to identify requiring improved services in the selected Districts	25,000.00
2.	Household surveys for need assessment	50,000.00
3.	Meetings with the Community and forming of CBOO and development of proposal	35,000.00
4.	Preparation of Technical proposal based on the community requirement	50,000.00
5.	Construction or upgrading of facilities involving community	3,500,000.00
	* Note : Cost estimate will depend in nature of project inclusive of labour costs. The cost stated here is not necessarily to Donor.	
6.	Contingencies	250,000.00
7.	Supervision	300,000.00
	TOTAL	4,210,000.00

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   Part one - Water Supplies in rural areas of developing countries
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4. Small Water Supplies - Sandy Cairncorss
   Richard Feachem - Ross Institute Information and advisory service - Bulletin No. 10 January 1978.

5. Water Purification Distribution and Sewage Disposal for Peace Corps. Volunteers R-29

6. Rural Water Supply Priority Investment Plans
   - Matara, Ratnapura and Badulla Districts
   Volume V, Preliminary Engineering Designs
   Part I - Module Designs & Costing

7. District Development Plans for Rural Water Supply & Sanitation Sector Development Planning Project Volume II Technologies in Rural Water Supply & Sanitation Haskoning Royal Dutch Consulting Engineers & Architects, Engineering Consultants Limited, June 1991.

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9. NGO Decade Service - Report on Activities December January 1991

10. Sri Lanka Rural Water Supply & Sanitation Sector Study - Planceter Ltd., in Association with Ovu Arup & Partners.

11. Statistical Report and Analysis of Social Development from 1980 to 1990 Sri Lanka State Plantation Corporation.

12. Statistical Report 1987
Janatha Estates Development Board

13. Second Water Supply Sector Project Sri Lanka
- Draft Final Report, Coffey Partners International Pty Ltd., July 1992

Appendix 1

PUBLICATIONS RELATED TO SRI LANKA WATER SUPPLY PROJECTS

1. Negombo Water Supply Scheme Prepared by Degremont, 1985.
   - Basic Design Report
     - Introduction and Basic Data
     - Hydraulic Studies and Pipes
     - Technical Description-Structures
     - Drawings
   - Basic Design Report
     - Negombo Secondary Pumping Plant
   - Basic Design Report
     - Appendixes

2. Market Town Water Supply Jaffna Project Prepared by Engineering Science, 1983.

   - Executive Summary Report
   - Financial Evaluation and recommended Master Plan

3. Market Town Water Supply Jaffna Project Prepared by Engineering Science, 1984.

   - Vol. I Executive Summary
   - Vol. II Master Plan
   - Vol. III Master Plan (Appendices)

4. Water Supply cum Mini Hydrel Project Diyatalawa-Haputale-Bandarawela : Ohiya Hydro Power Plant Feasibility Study Prepared by AIB Consulting Engineers, 1984.

5. Water Supply cum Mini Hydrel Project Diyatalawa-Haputale-Bandarawela Prepared by Engineering Consultants, 1984.
   - Feasibility Report
   - Vol. 1 Water Supply
   - Vol. 2 Ohiya Dam
   - Vol. 3 Drawings
     - Part 1 Ohiya Dam
     - Part 2 Water Supply

6. Kurunegala Area Water Supply : Draft Feasibility Study Prepared by GITEC, 1980.

7. Planning of Rural Water Supply and Sanitation Programme in Matale and Polonnaruwa District : Draft Report Prepared by KAMPSAX-KRUGER, 1982.

   1. Technical Sociological and Financial Report
   2. Maps
   3. Appendices
   4. Ground Water Data and Analysis
   5. Surface Water Data and Analysis

6. Inventory of Villages
Part I
Part II

8. Planning of Rural Water Supply and Sanitation Programme in Matale and Polonnaruwa District Prepared by KAMPSAX-KRUger, 1983.
Vol. 1 Findings and Implementation Plan
Vol. 2 Maps and Drawings
Vol. 3 Appendices
Vol. 4 Basic Data Hydrogeology
Vol. 5 Basic Data Hydrology
Vol. 6 Village Inventory
Vol. 7 Executive Summary

9. Support to the Rural Water Supply and Sanitation Sector in Matale, Polonnaruwa and Anuradhapura Districts Final Reports Prepared by KAMPSAX-KRUGER, 1992.

Vol. I : Summary of Objectives, Mode of Implementation and Achievements 1980-1991.

Vol. II : Rural Water Supply Hand Pumps - System Drawings, Operation Maintenance and Cost Recovery.

Vol. III : An Impact Assessment of Sanitation Facilities Provided by the Project - Case Study of Five Selected Villages.

Vol. IV A : Assessment of Rehabilitation Needs of Tube Wells in Anuradhapura District.

Vol. IV B : Assessment of Rehabilitation Needs of Tube Wells in Anuradhapura District, Location Maps.

Vol. V : Assessment of Rehabilitation Needs of Piped Schemes in Anuradhapura Districts.

10. Feasibility Study on Water Supply Scheme for Amparai Group of Towns, Prepared by Japan International Cooperation Agency, 1982.

11. Integrated Water Supply Project for Amparai Group of Towns Sammanthurai-Kalmunai-Akkaraipattu Water Supply Scheme, Prepared by Engineering Consultants, 1982.

12. Trincomalee Water Supply : Definitive Operating Instructions Prepared by Degremont, 1984.
- Appendix

13. Matara Water Supply Project Appraisal Report Prepared by HALCROW-BALFOUR Ltd. 1979.

14. Matara Water Supply Project Phase II Prepared by HALCROW-BALFOUR Ltd. 1985.

15. Draft Report on the Water supply for Towns North of Colombo and Ja-ela (Preliminary Operations) Prepared by Haigh Zinn & Humphreys, 1968.

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Vol. VII Preliminary Engineering Designs : Part 3 Badulla, Pre-Engineering Design Documents 40 Villages - Small Towns
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Figure 20	Protection of a spring catchment in shape of T
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Figure 39	Chlorination system - Floating constant head feeding device
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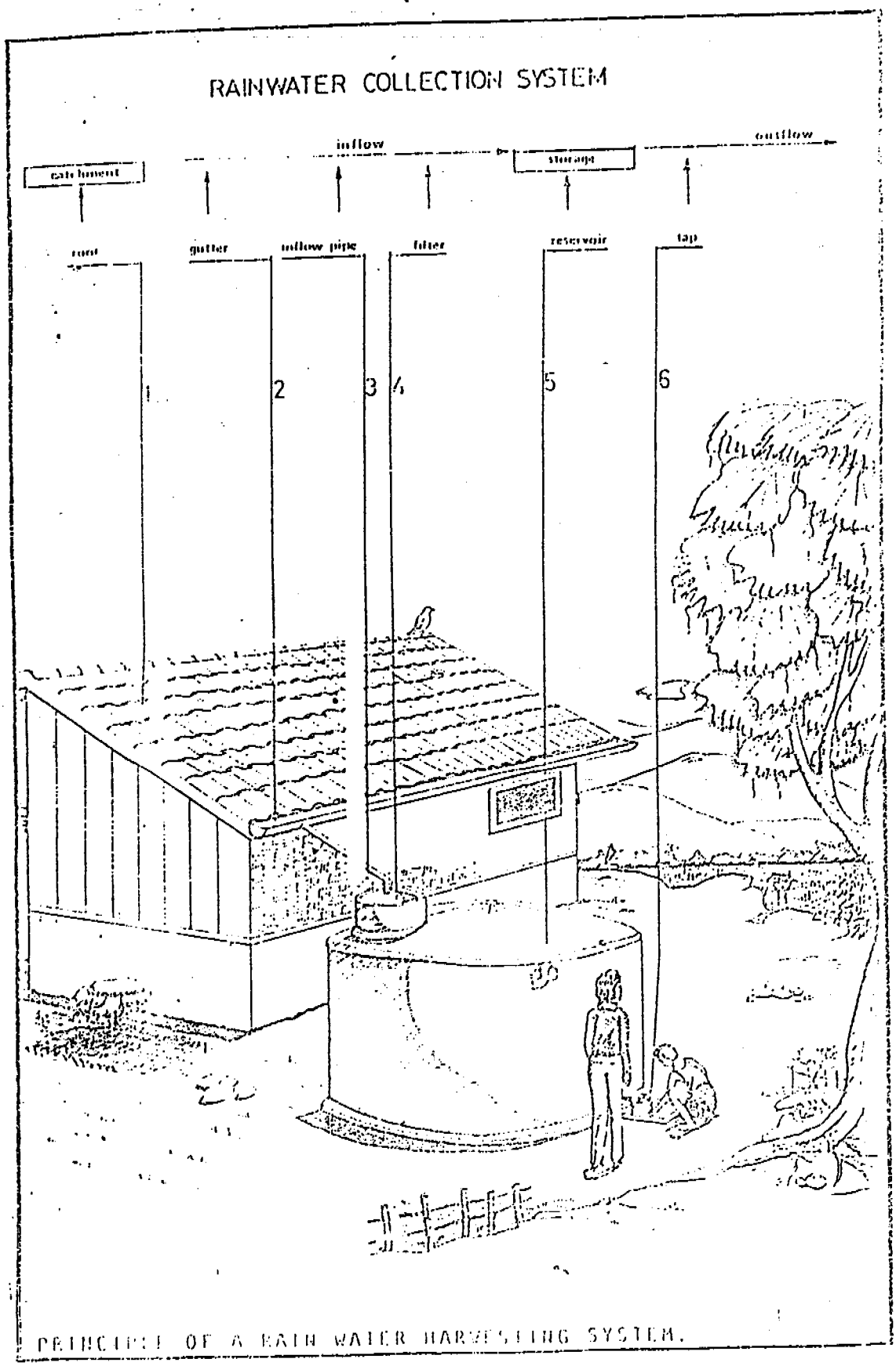
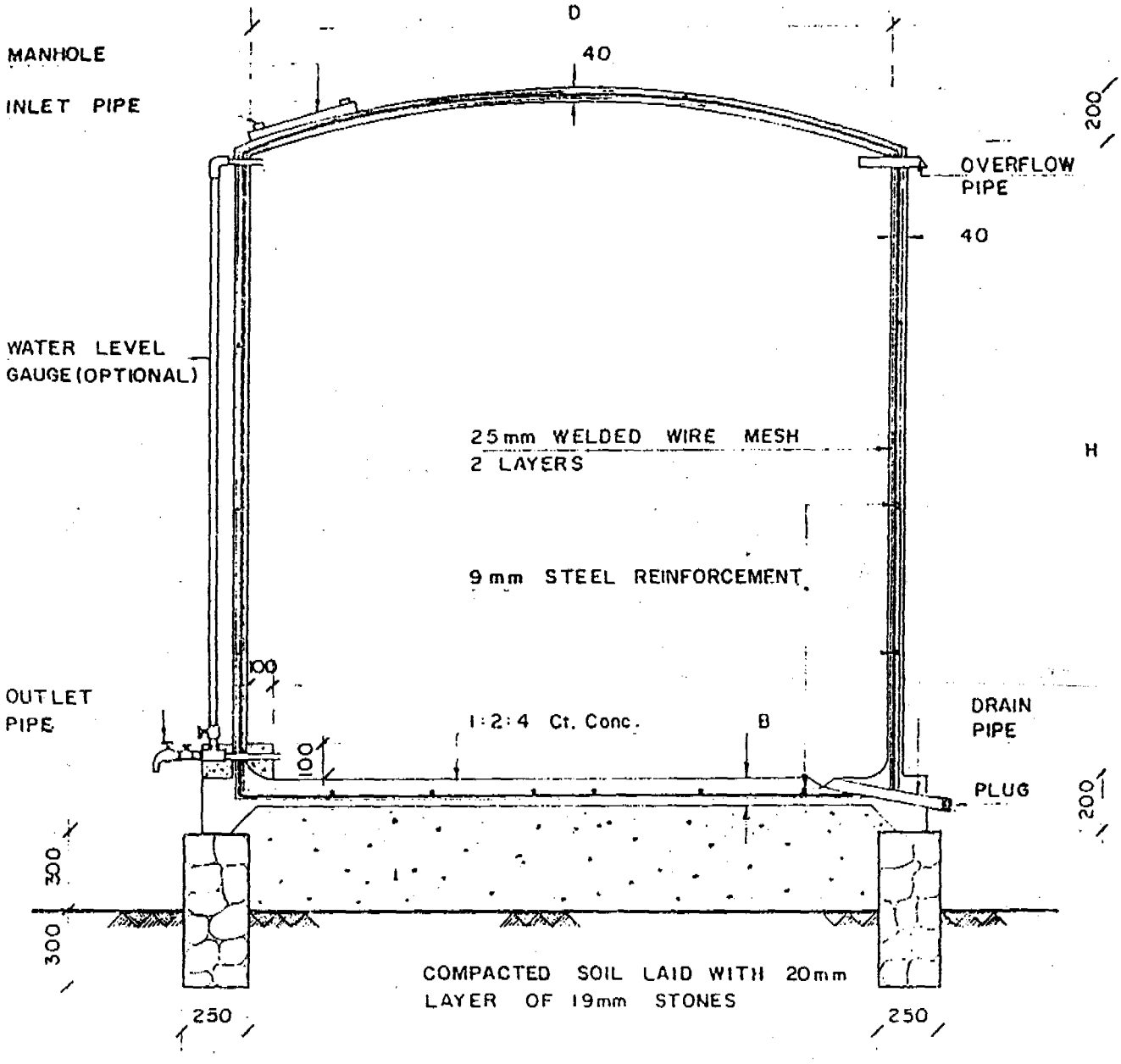

RAINWATER COLLECTION SYSTEM
inflow
outflow
catchment
storage
roof
gutter
inflow pipe
filter
reservoir
tap
1
2
3
4
5
6
PRINCIPLE OF A RAIN WATER HARVESTING SYSTEM.

Fig:1

SYMBOLS	1500 L.	3500 L.
B	100	100
D	1250	1650
H	1250	1650

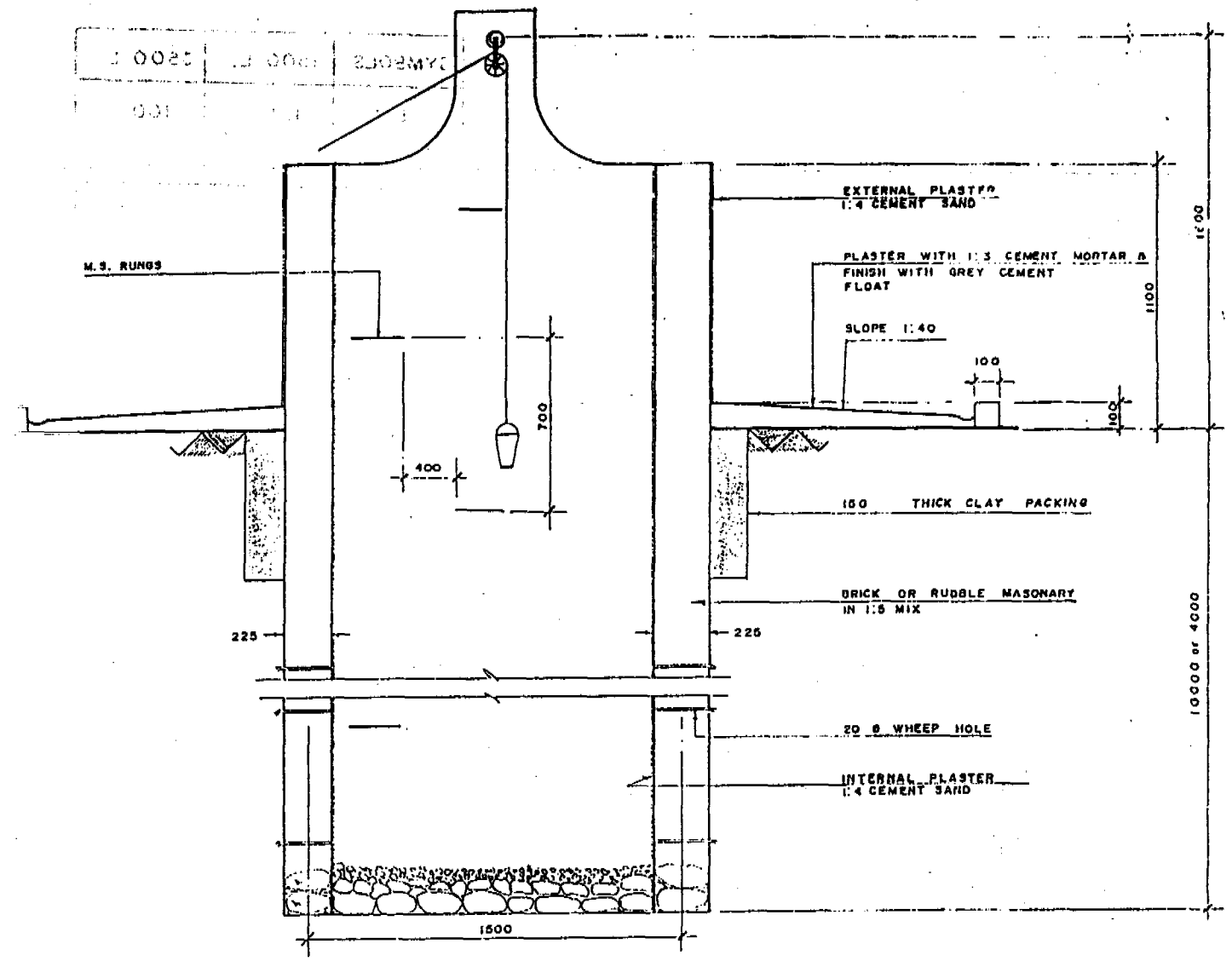


ALL DIMENSIONS ARE IN mm.

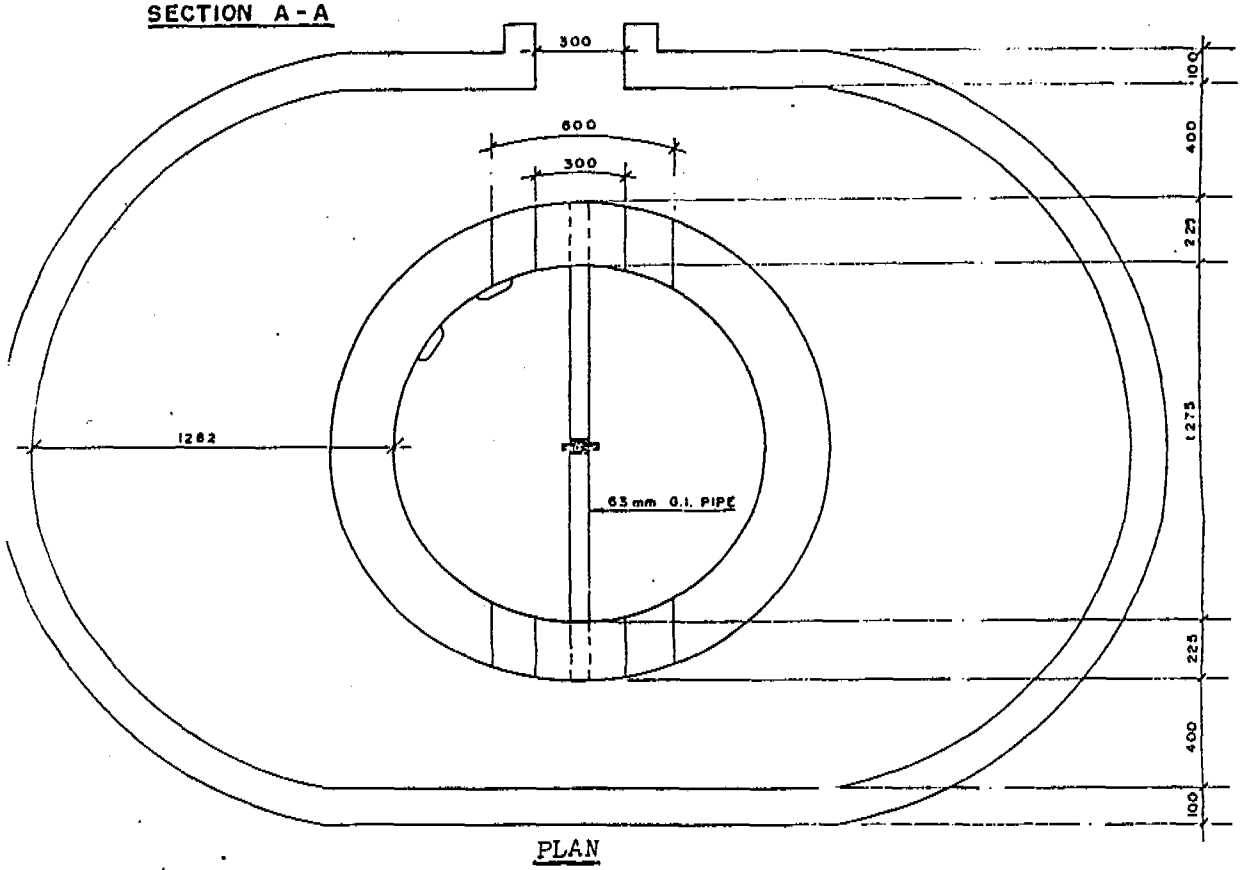
DETAILS & DIMENSIONS OF FERROCEMENT TANK

(ADOPTED FROM RAIN WATER CATCHMENT IRDC – MR 127 e – 1986)

Fig:4



SECTION A-A

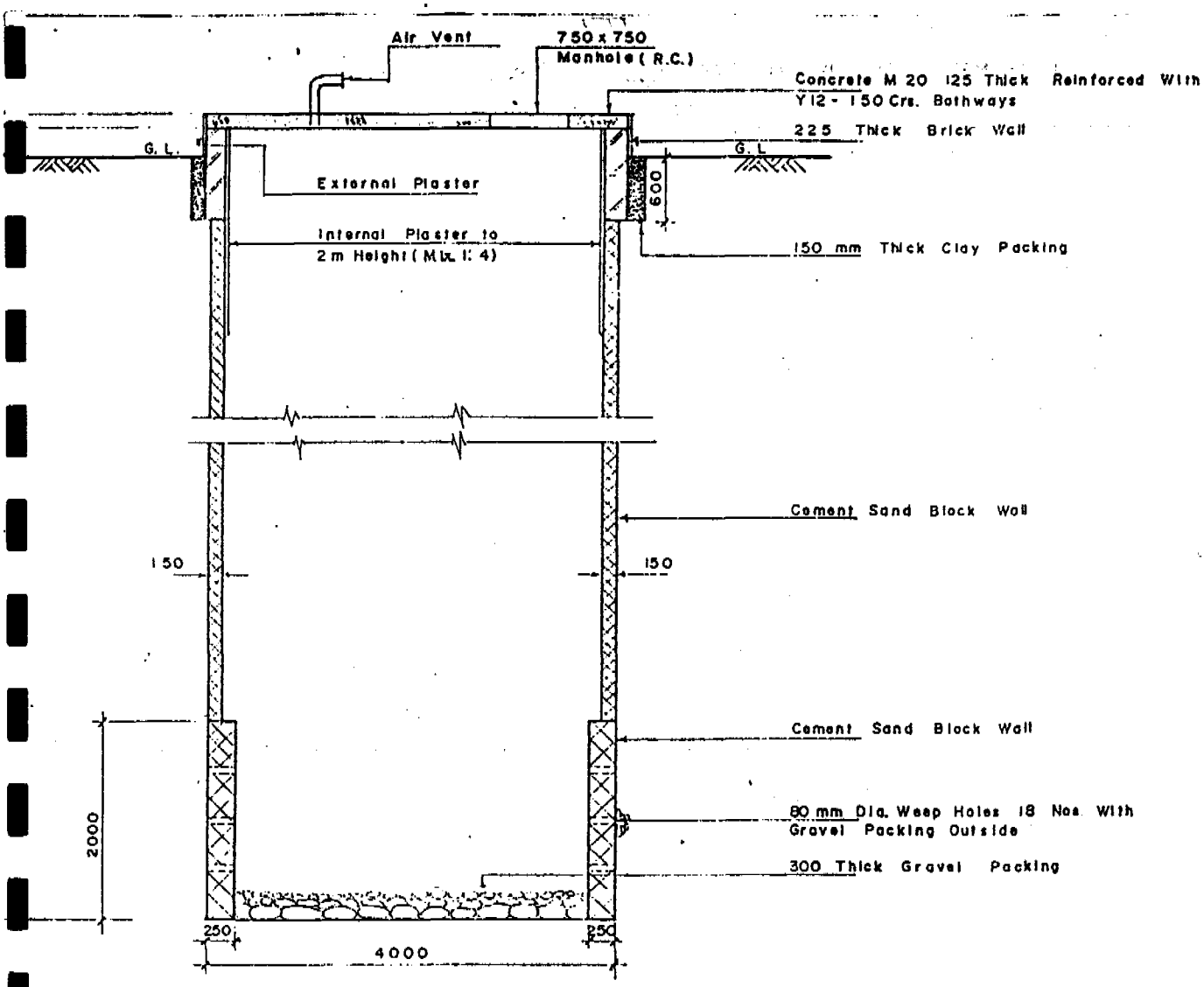


A1

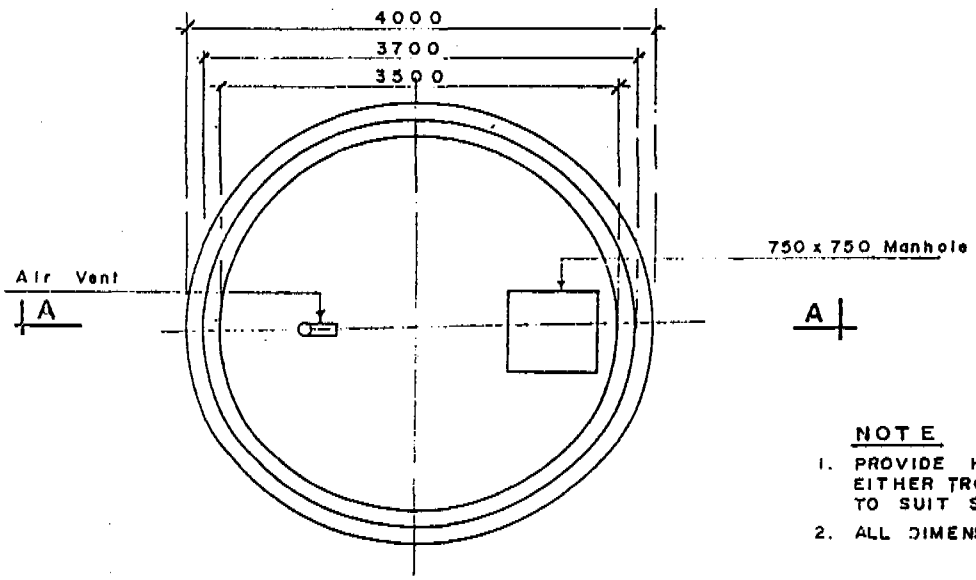
PLAN

Fig:5 - DUG WELL WITH APRON 1.5m Dia. WITH PULLEY BLOCK.

Note: All Demensions are given in millimetres.



SECTION A - A



PLAN

NOTE

1. PROVIDE HOL[E] FOR SUCTION PIPES EITHER TROU[GH] WALLS OR COVER SLAB TO SUIT SIT[E] NDITION
2. ALL DIMENSIO[NS] ARE IN MILLIMETRES

DUG WELL COVERED 4m Dia FOR MECHANISED PUMP INTAKE.

Fig.10.

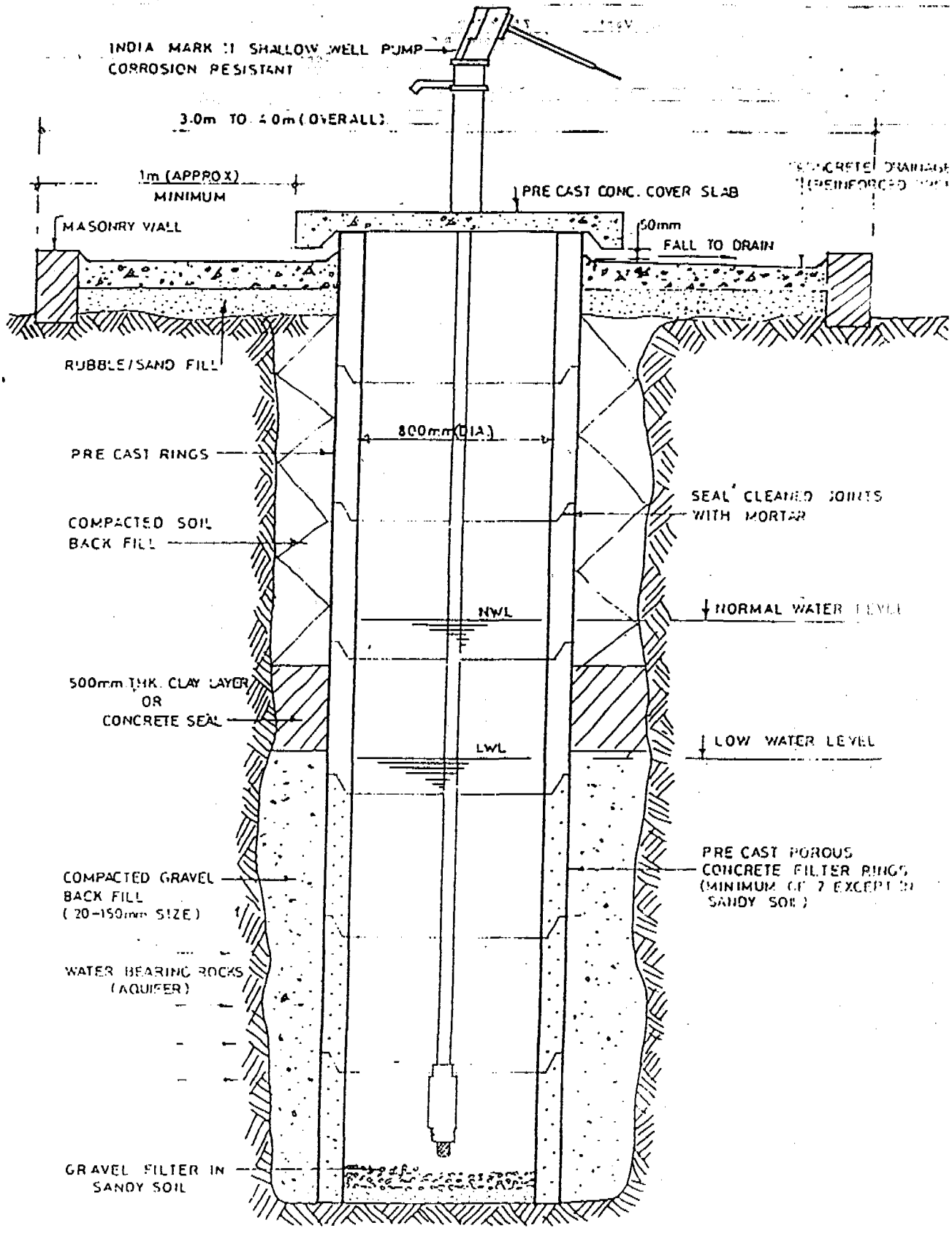


Fig. 9
Typical Hand Dug Well
(DEPTH MINIMUM 5.0m)

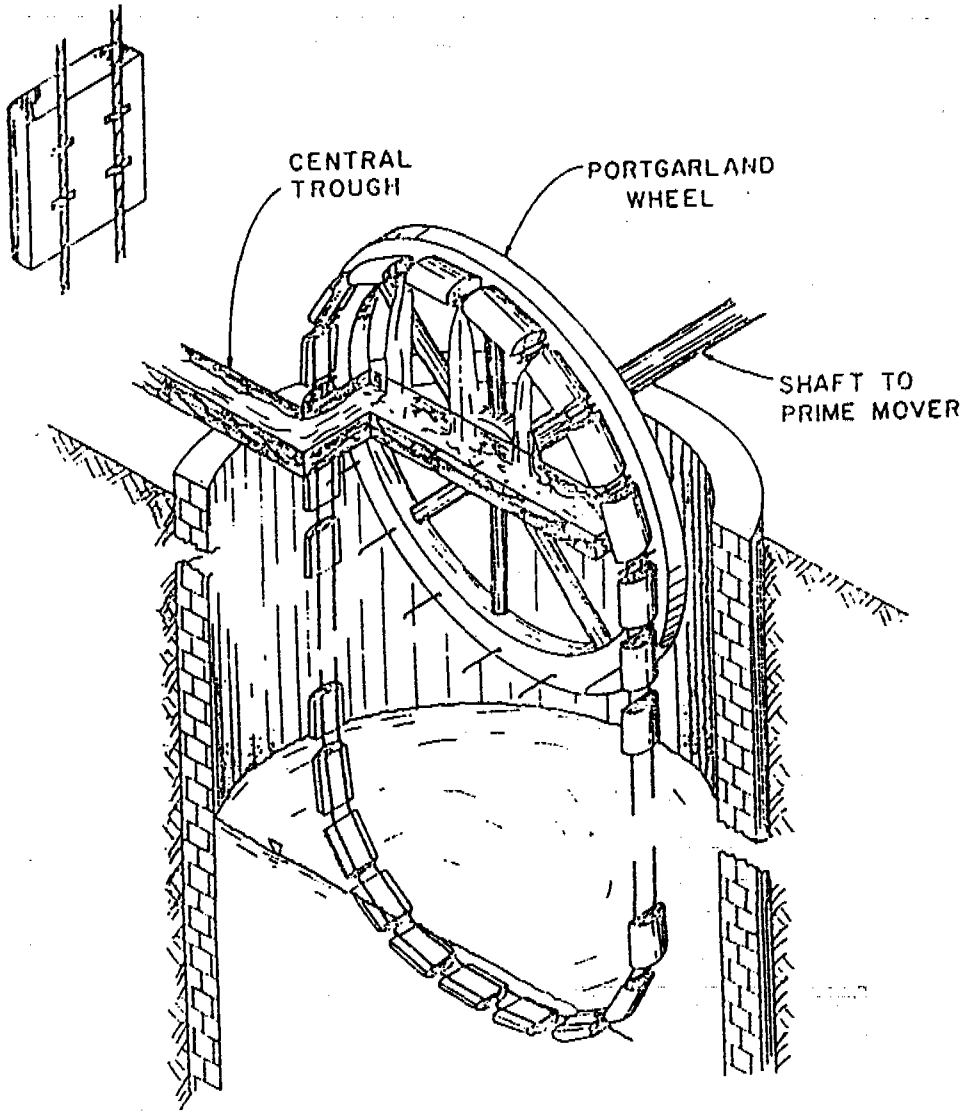


Fig:12 - A CHAIN OF BUCKET (PERSIAN WHEEL) DEVICE FOR RAISING WATER, WITH A 'PORTGARLAND WHEEL' DRIVEN BY A HORIZONTAL SHAFT. (From Hoo')

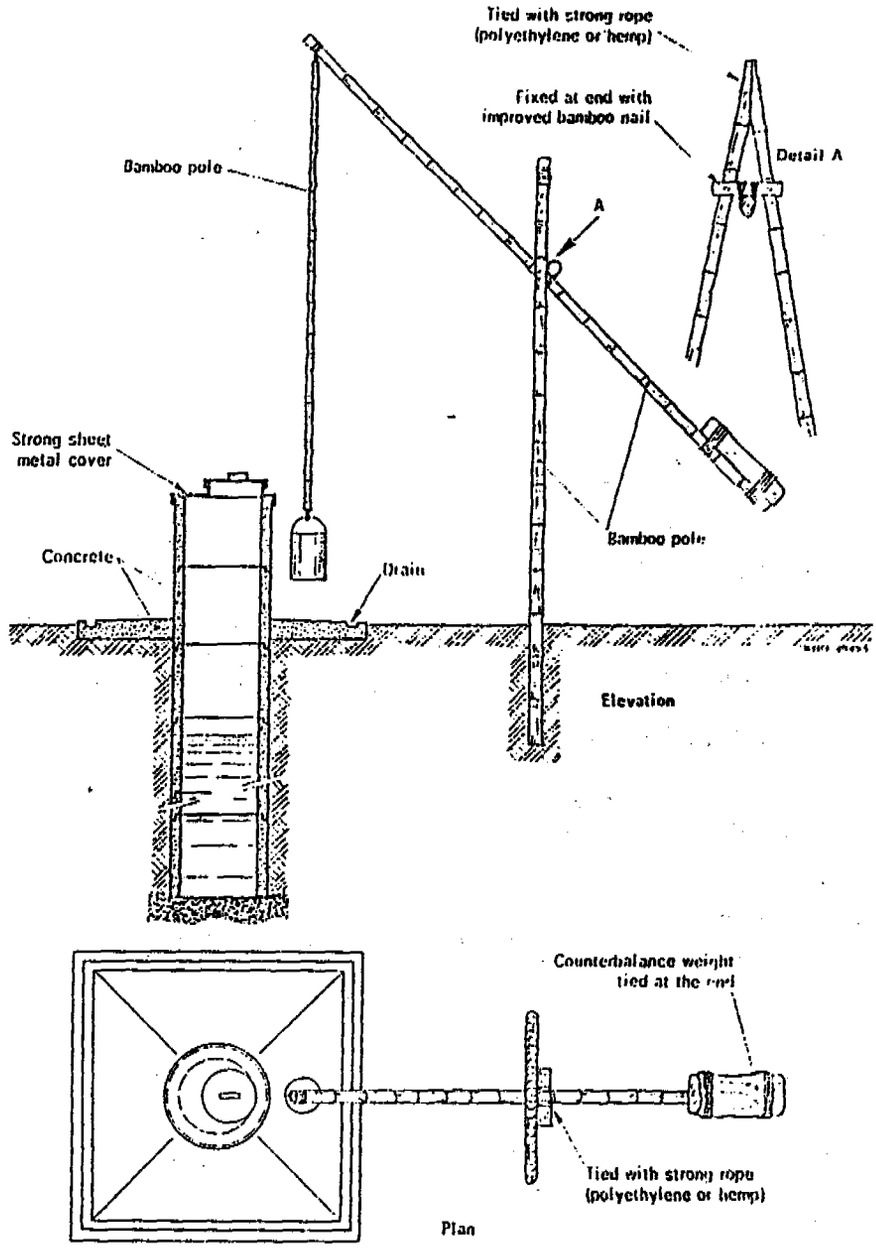
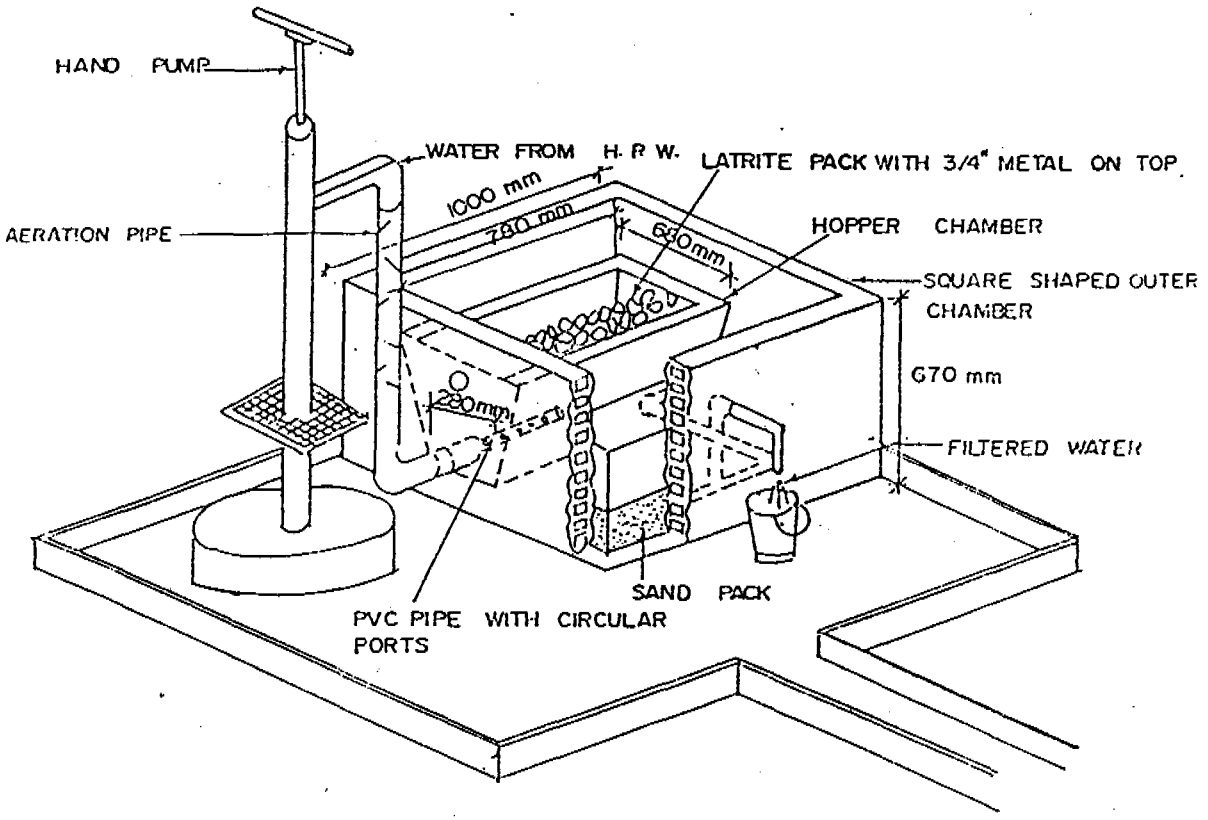


Fig:13 - A SHADUF USED OVER A HAND DUG WELL

FINNIDA SQUARE TYPE FILTER



FE AND Mn REMOVAL IN FINNIDA FILTERS WITH CHARCOAL AS MEDIA IN 4020-UN

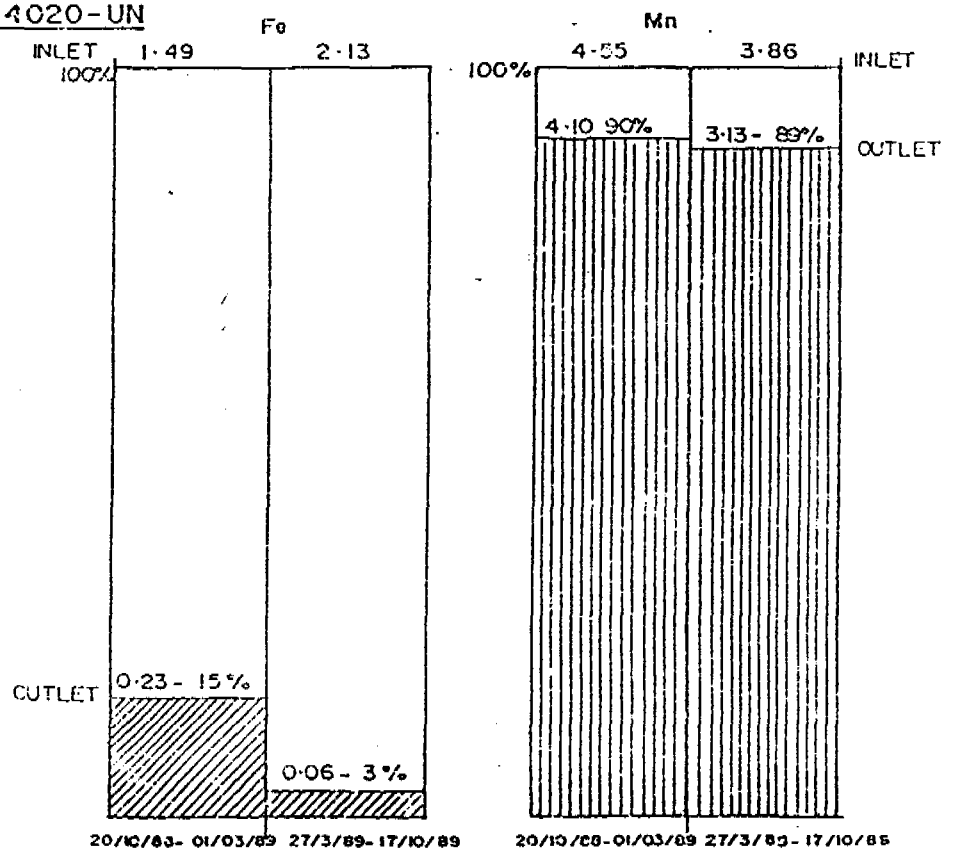


Fig:16

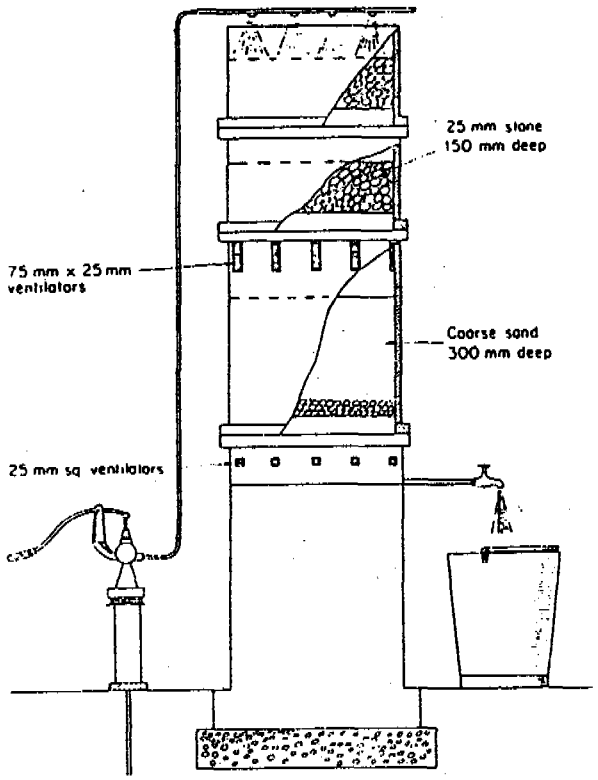
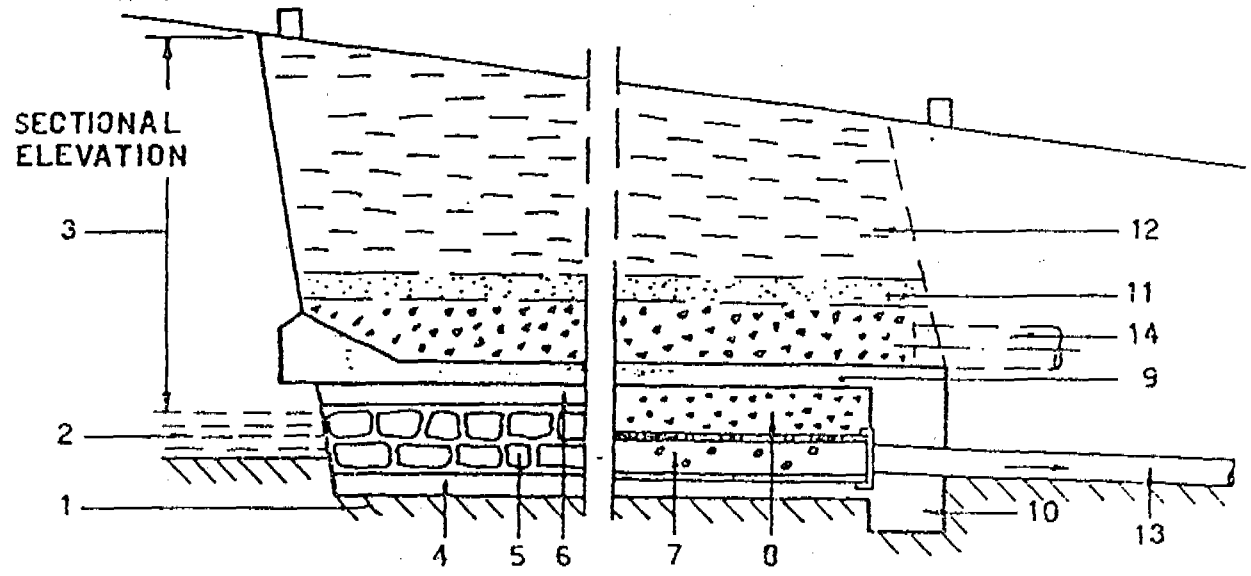
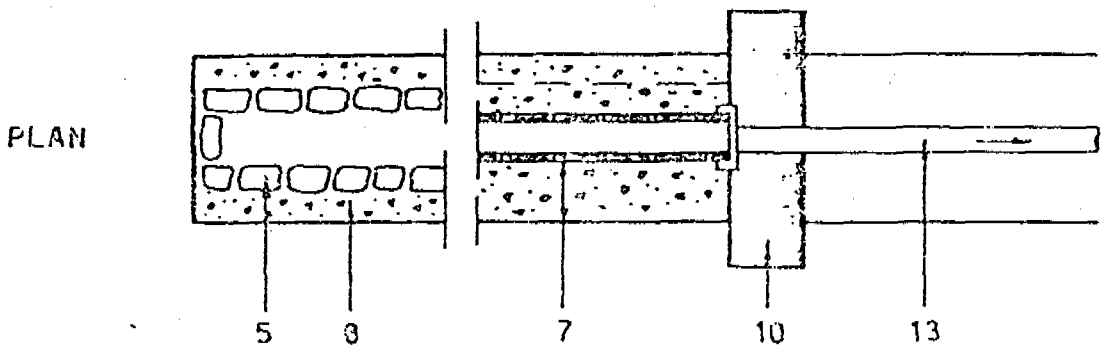


Fig:18 - A HAND OPERATED AERATOR/FILTRATION UNIT

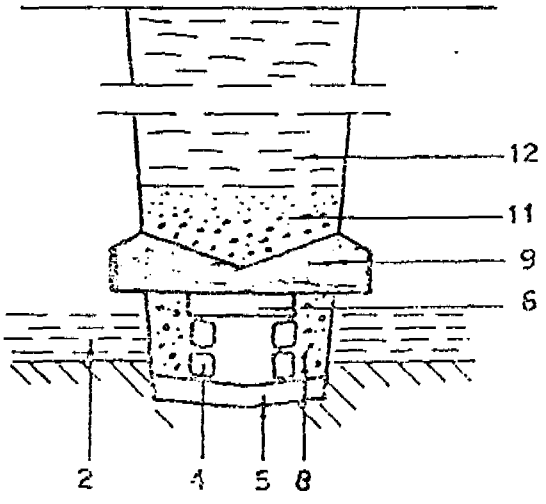
Fig. 30 *Spring catchment in line*



1 IMPERMEABLE STRATA
2 WATER-BEARING SOIL
3 COVER OF WATER BEARING SOIL
4 BED PLATE 1-2 %
5 DRY WALL
6 SLABS
7 PERFORATED PIPE
8 GRAVEL
9 WATER-TIGHT COVER
10 DAM
11 PERMEABLE MATERIAL
12 IMPERMEABLE BACKFILLING
13 SUPPLY PIPE 2 %
14 DRAIN FOR SURFACE WATER



CROSS-SECTION TYPE 1



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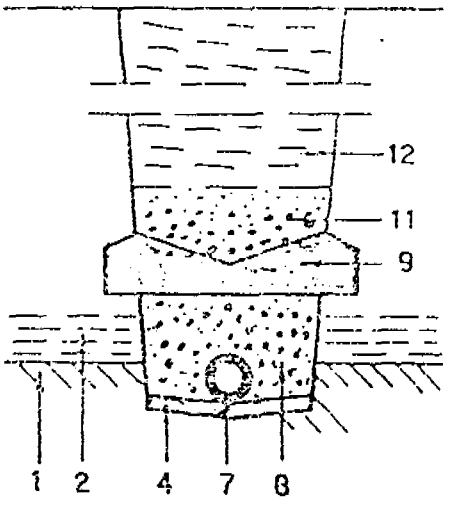
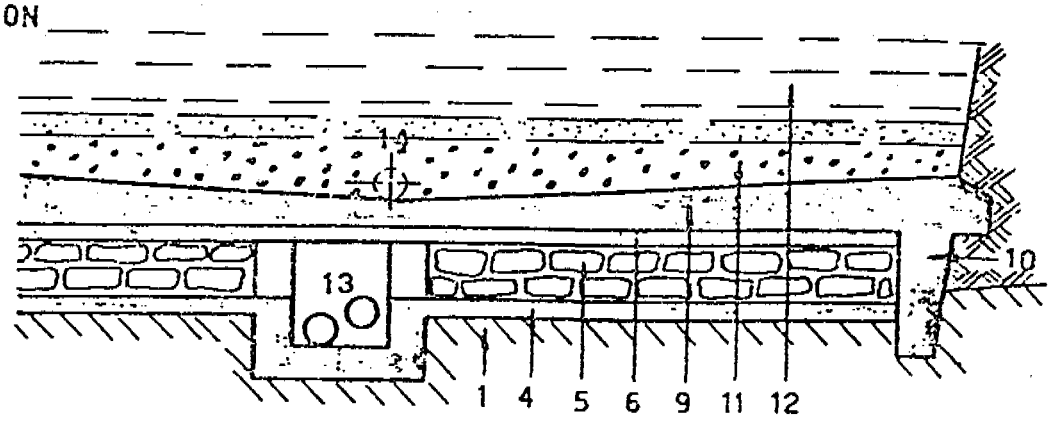


Fig:19 - PROTECTION OF SPRING CATCHMENT IN LINE

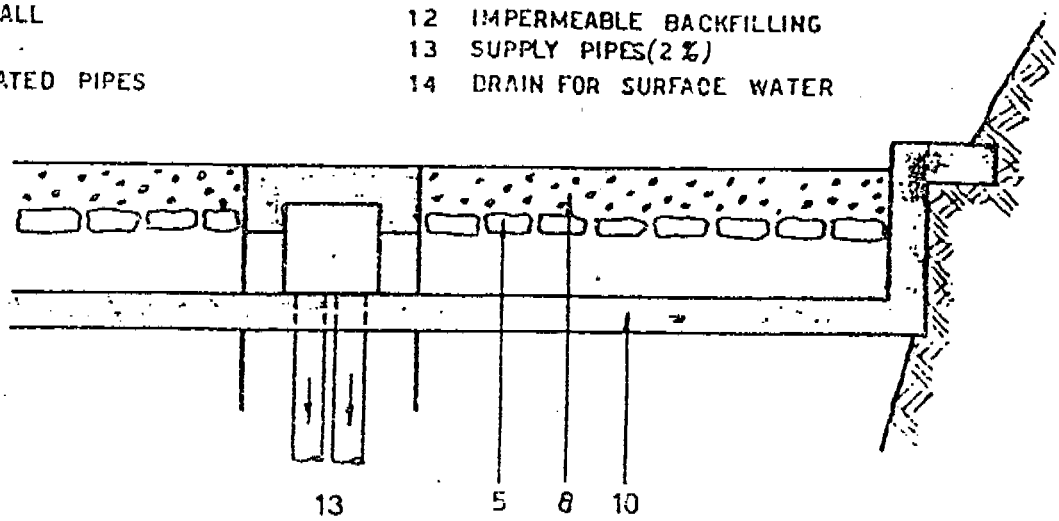
Fig. 31 Spring catchment in shape of a T

SECTIONAL ELEVATION

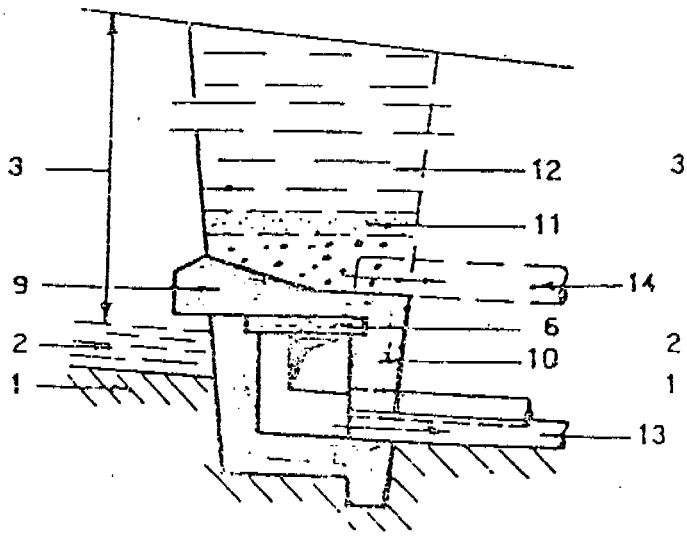


1 IMPERMEABLE STRATA
2 WATER-BEARING SOIL
3 COVER OF WATER-BEARING SOIL
4 BED PLATE (1-2 %)
5 DRY WALL
6 SLABS
7 PERFORATED PIPES
8 GRAVEL
9 WATERTIGHT COVER
10 DAM
11 PERMEABLE MATERIAL
12 IMPERMEABLE BACKFILLING
13 SUPPLY PIPES(2 %)
14 DRAIN FOR SURFACE WATER

PLAN



CROSS-SECTION
COLLECTION CHAMBER



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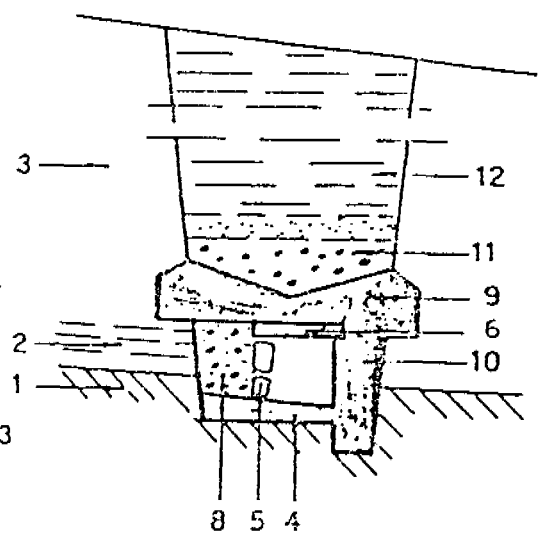
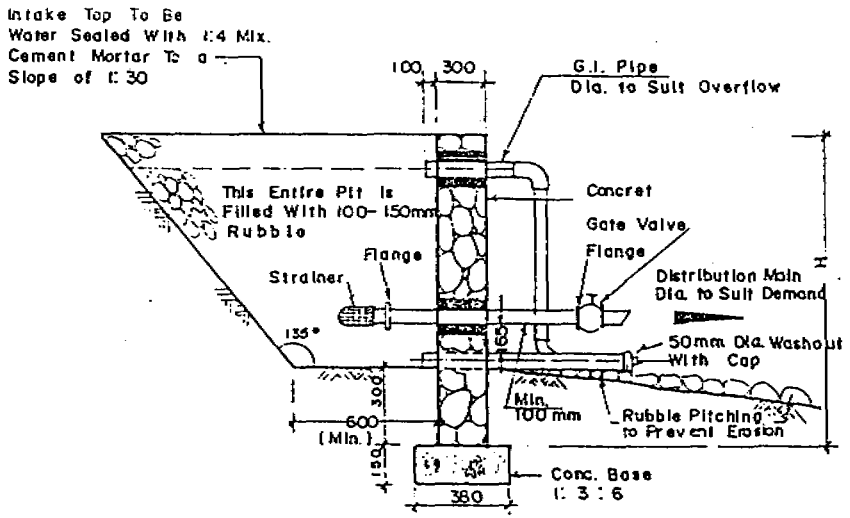


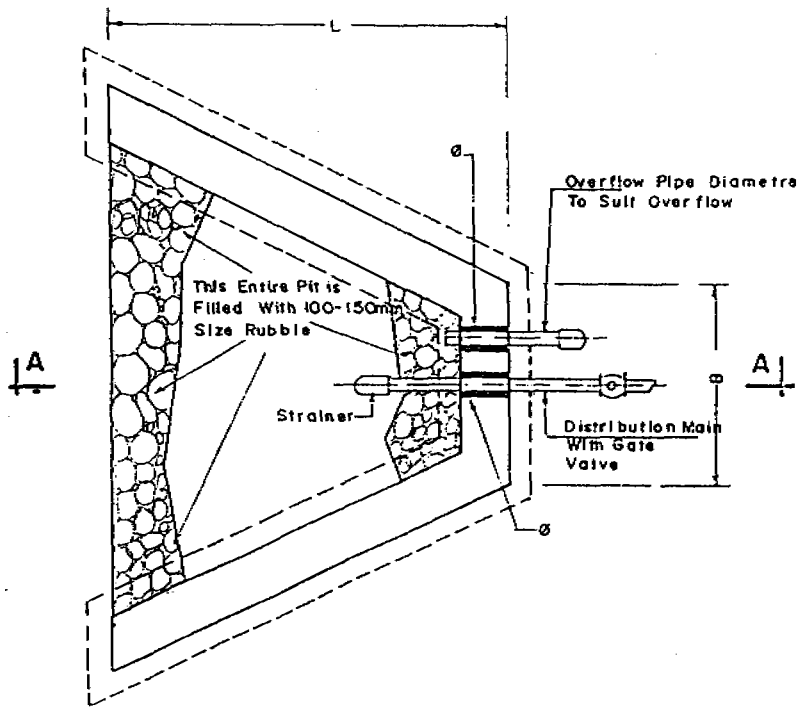
Fig:20 - PROTECTION OF SPRING CATCHMENT T. SHAPE

SPRING INTAKE

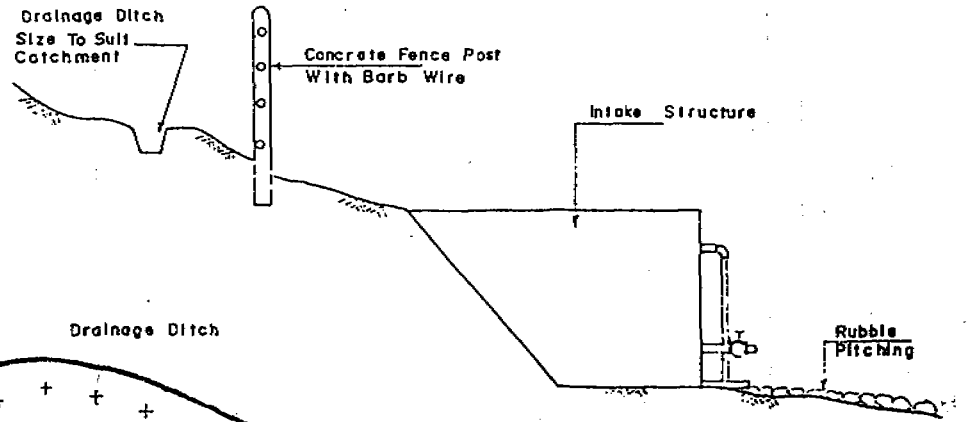
PROTECTION OF SPRING INTAKE FOR SLOPING GROUND



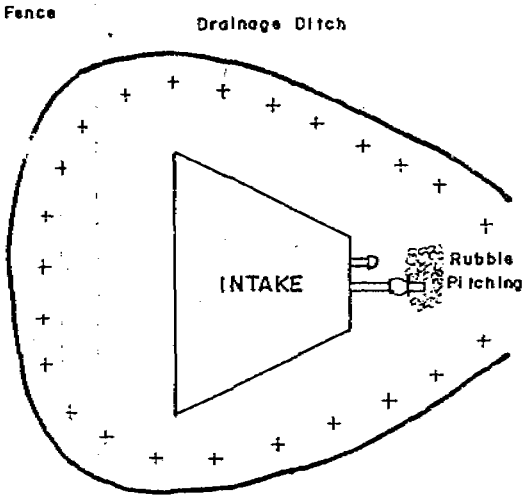
SECTION A - A



PLAN



ELEVATION



SITE PLAN

NOTES

1. L, B, H & Ø TO SUIT CONDITIONS.
2. OVERFLOW PIPE TO SUIT THE ESTIMATED OVERFLOW AND TO BE FIXED LOWER TO THE SPRING
3. WELL VIBRATED CONCRETE 1:2:4 (3/4") TO BE LAID ROUND THE G.I. CONNECTIONS TO STRUCTURE
4. ALL DIMENSIONS ARE IN MILLIMETRES

Fig - 21

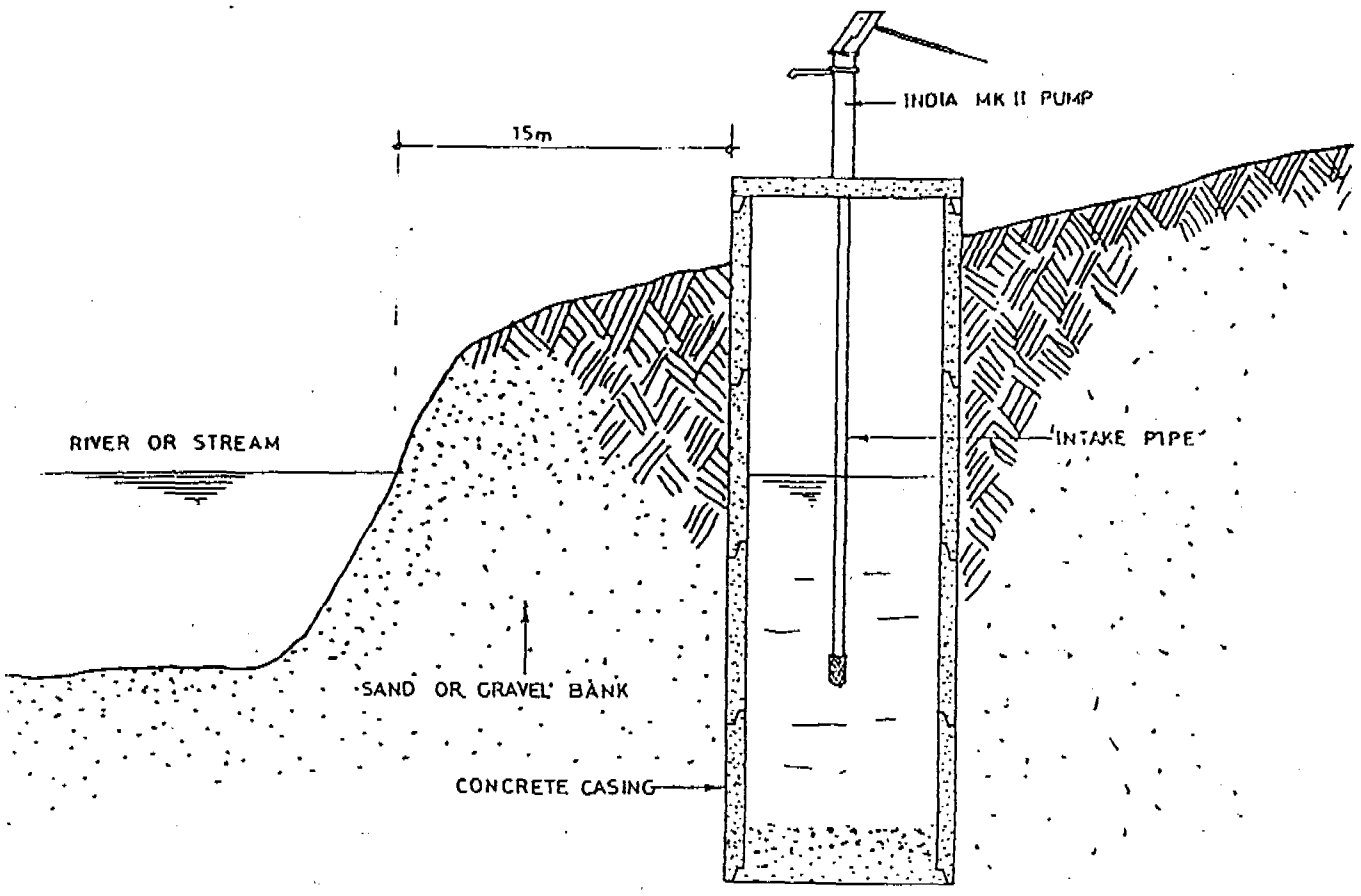
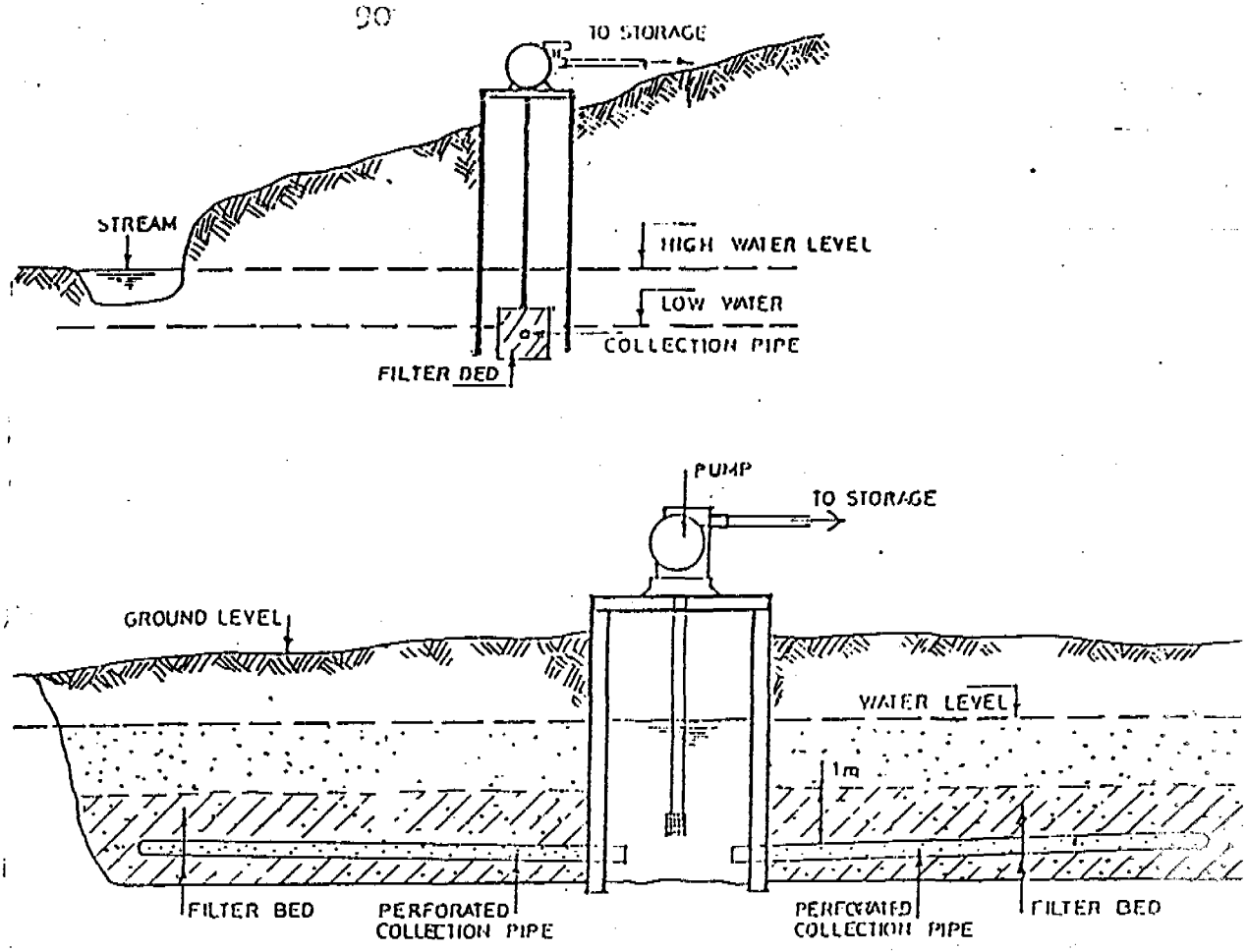
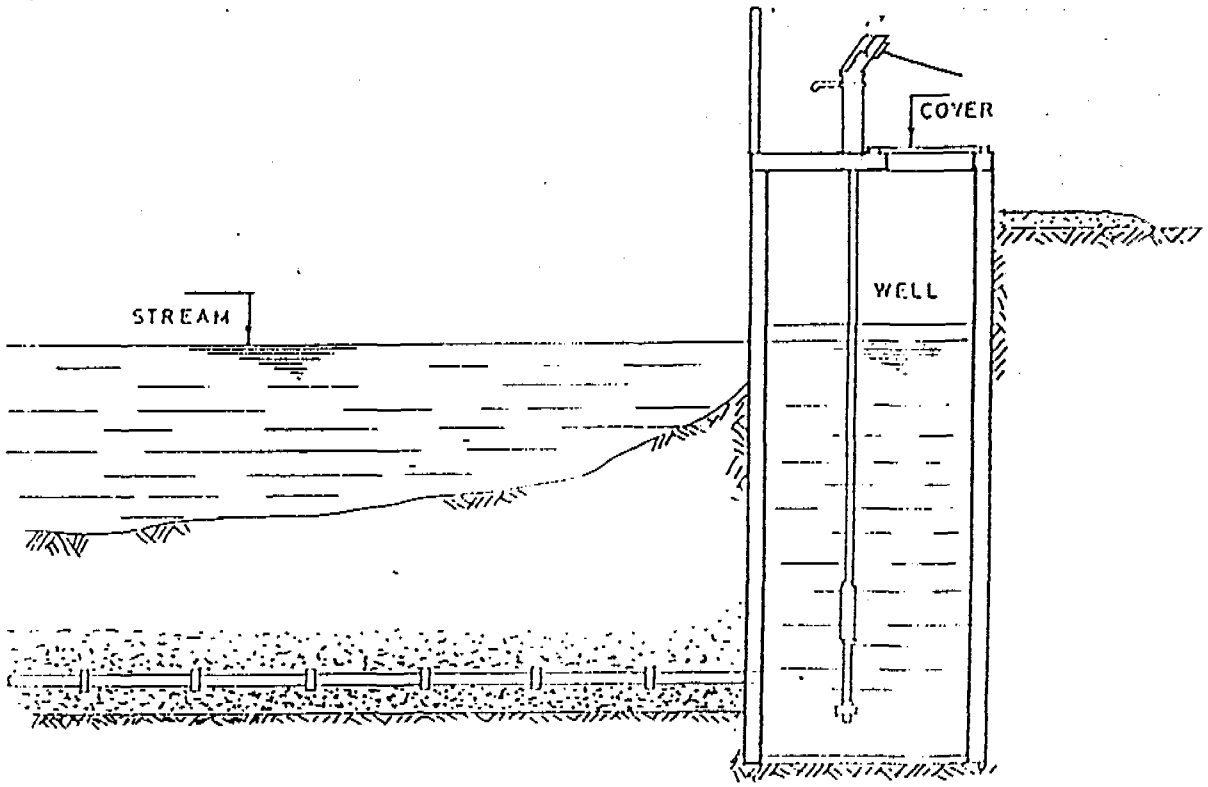


Fig:22- RIVERSIDE WELL INTAKE

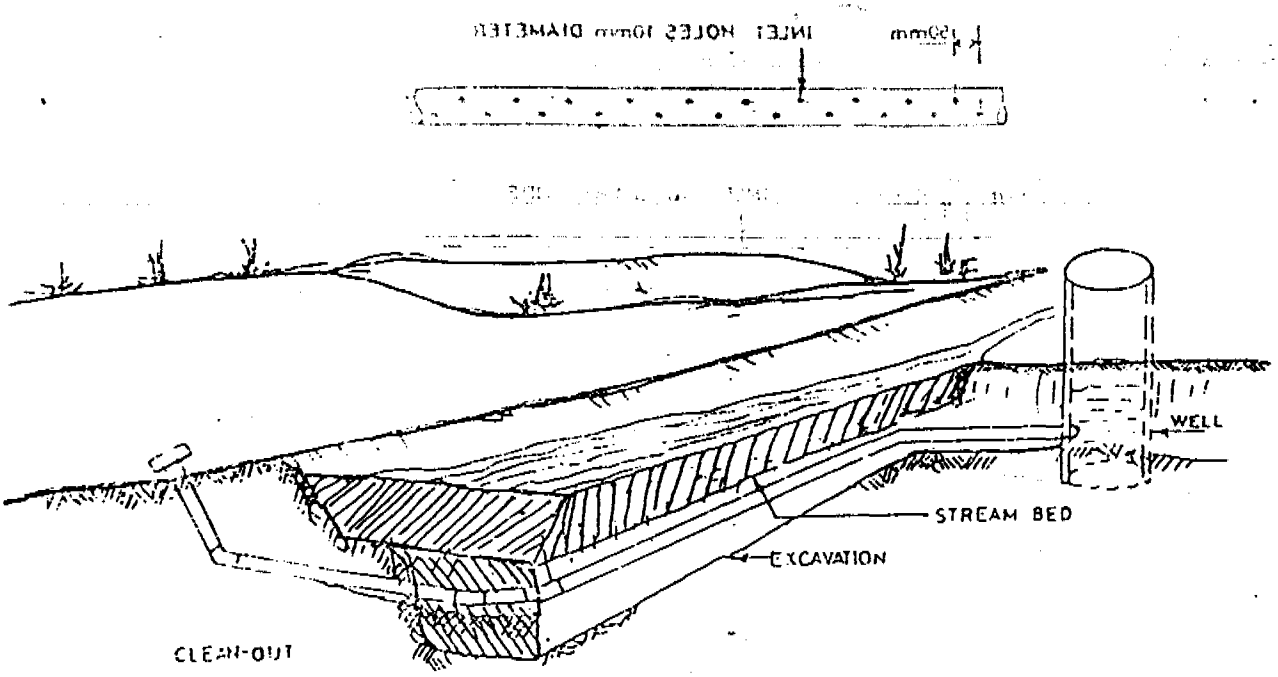


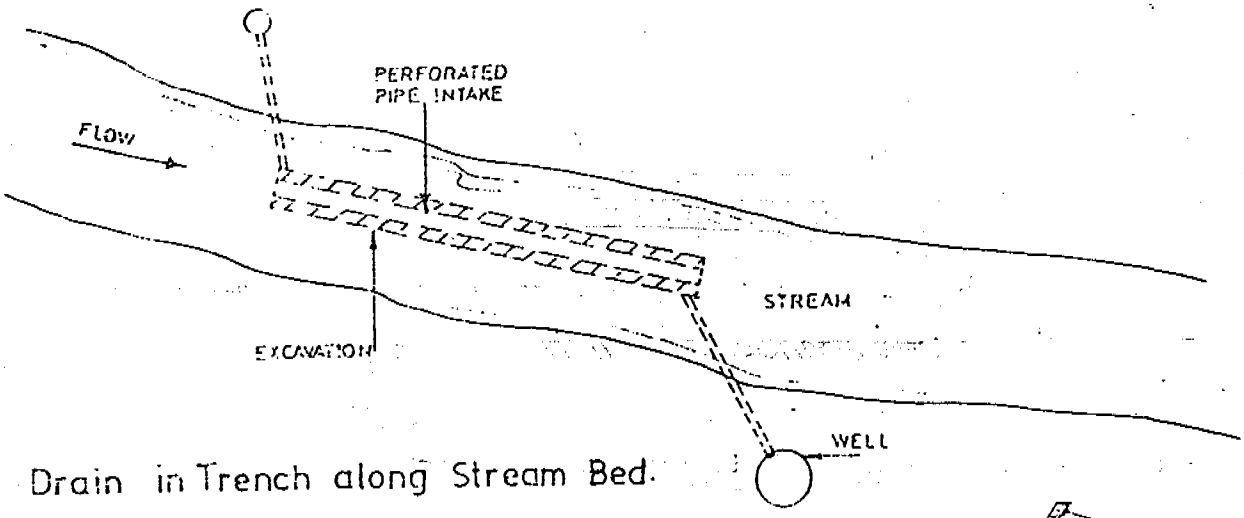
(a) Riverside Infiltration Intake.



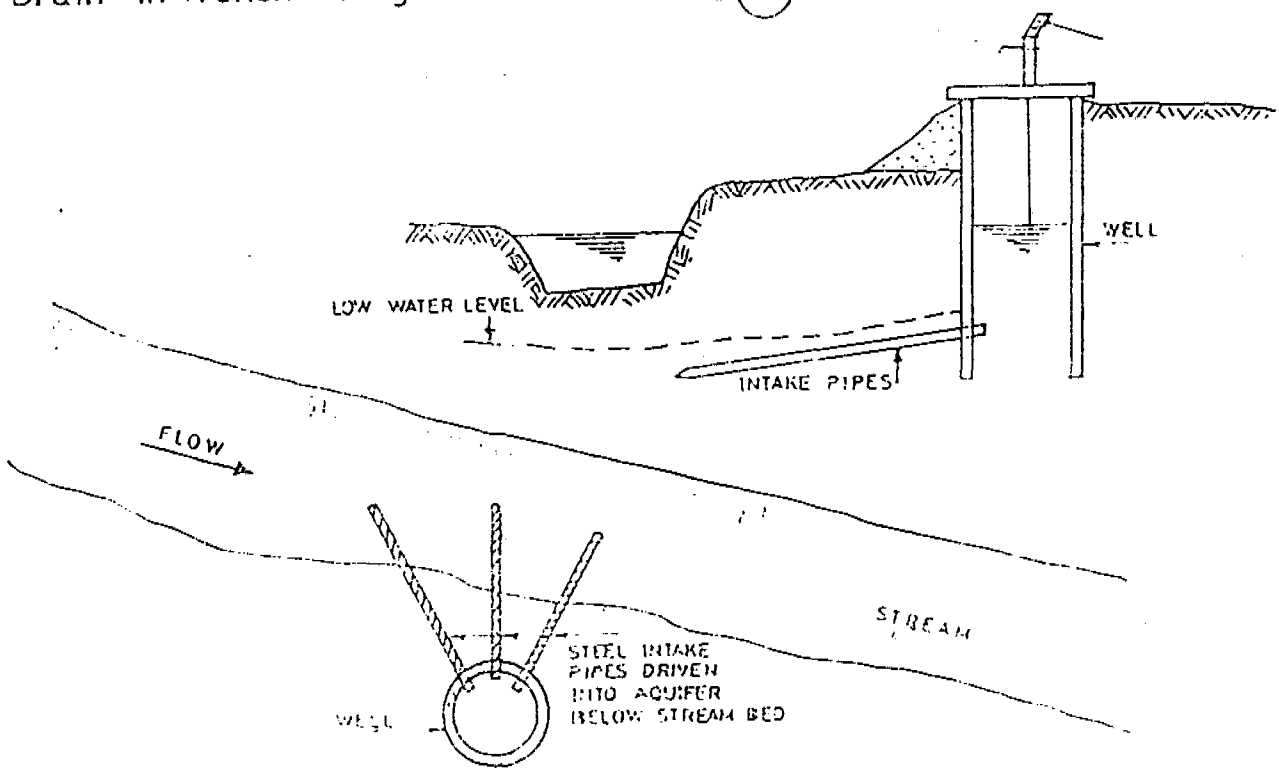
(b) Drain in Trench across Streambed

Fig:23 - INFILTRATION INTAKES



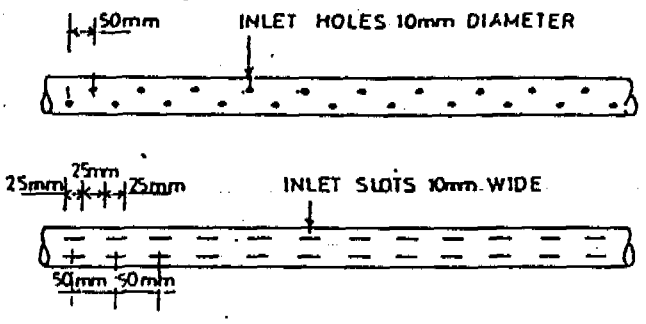


Drain in Trench along Stream Bed.

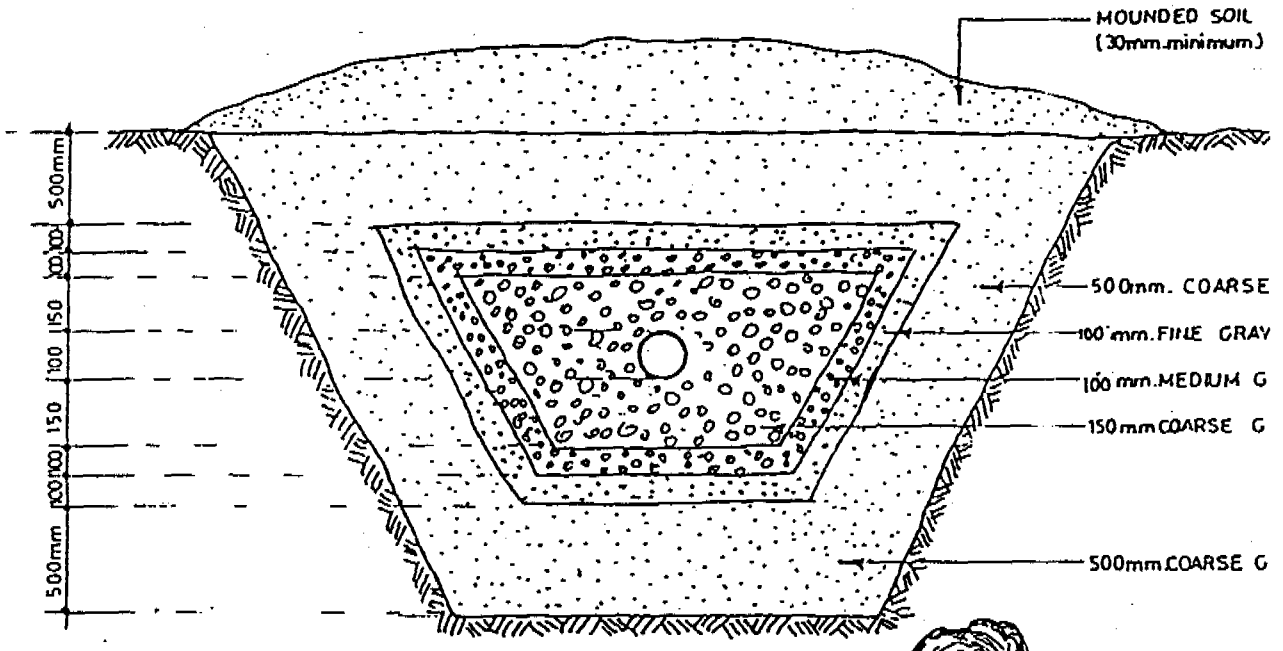


Pipes Driven under Stream Bed.

Fig:24 - INFILTERATION INTAKES

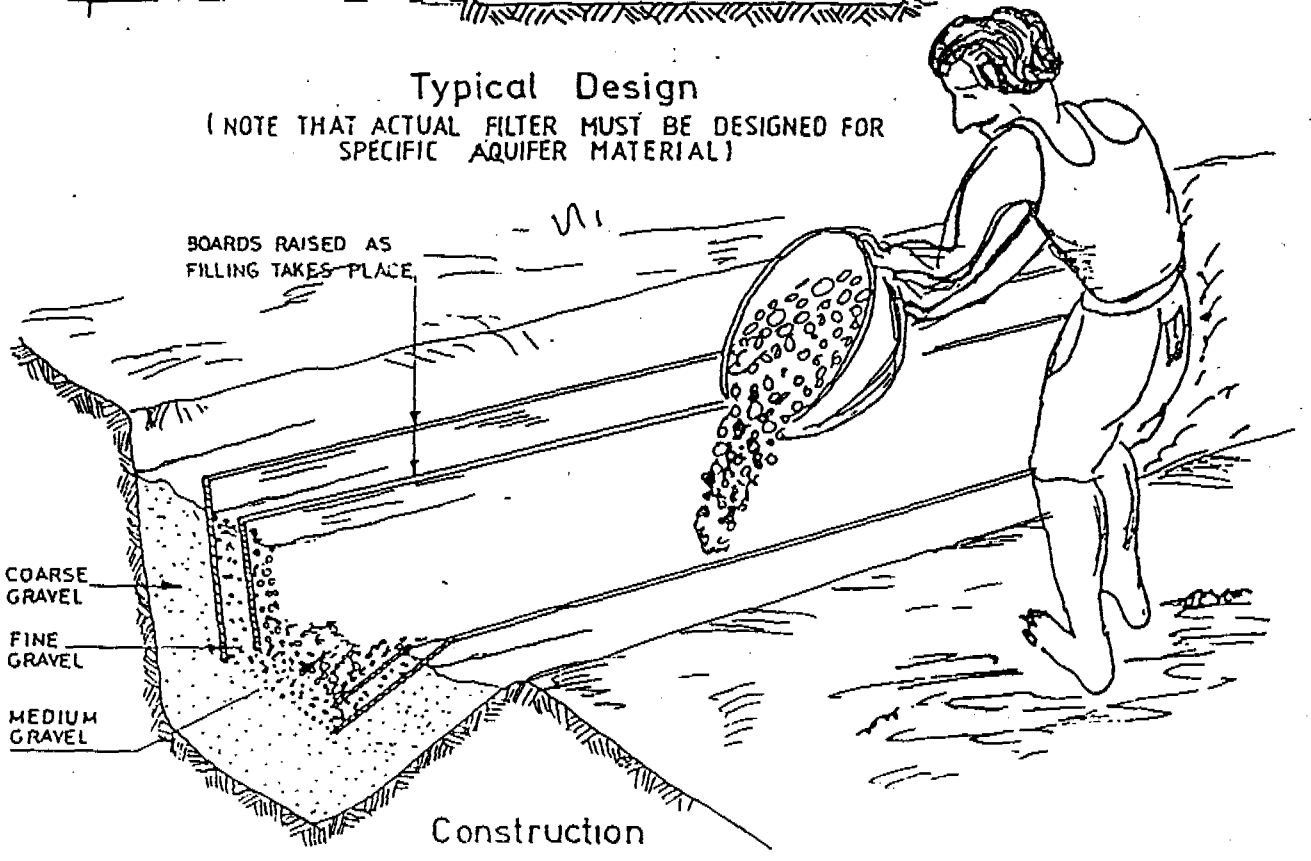


Typical Collection Pipes



Typical Design

(NOTE THAT ACTUAL FILTER MUST BE DESIGNED FOR SPECIFIC AQUIFER MATERIAL)



Construction

Fig:25 - INFILTRATION TRENCHES (Design & Construction)

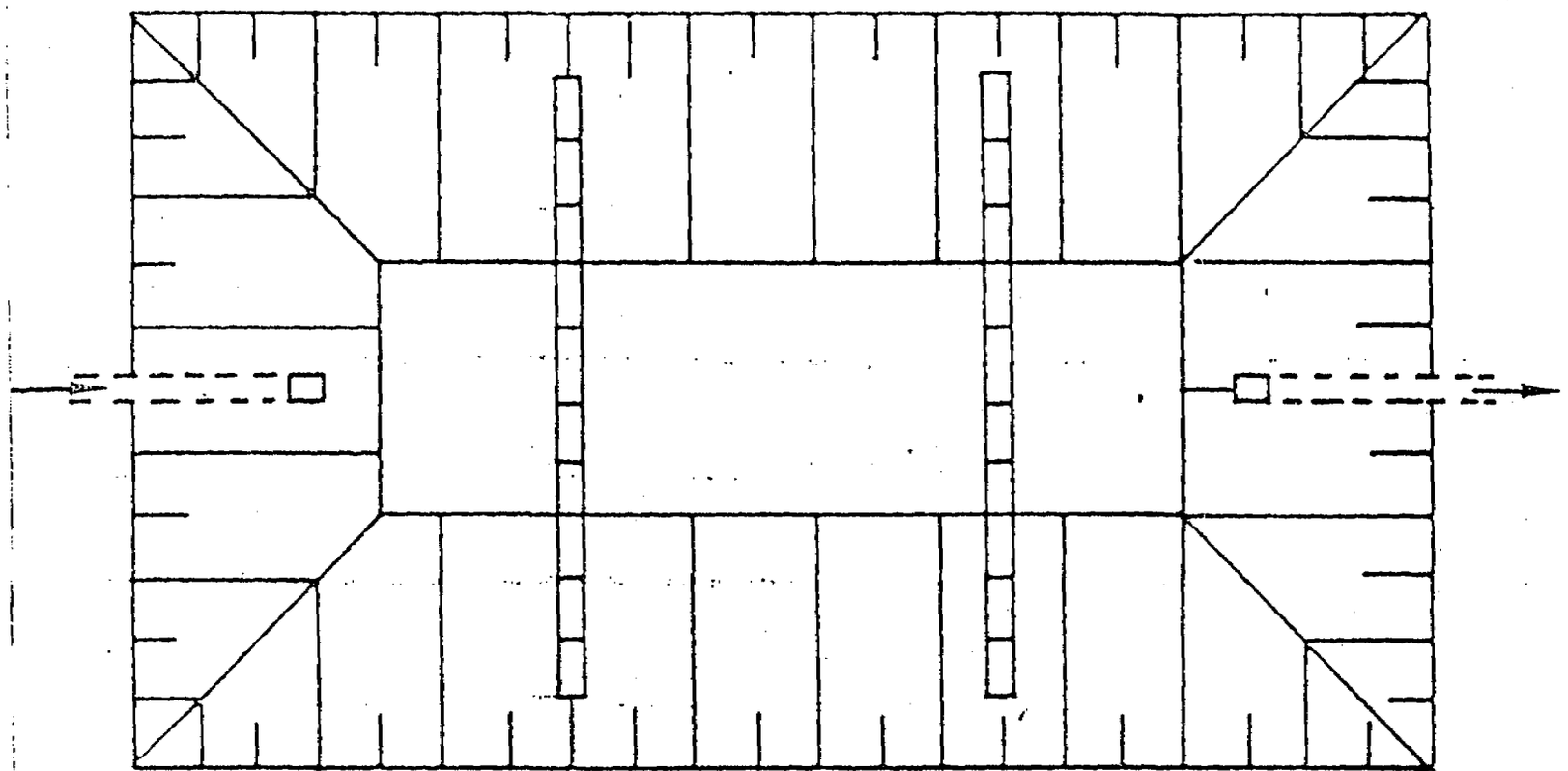
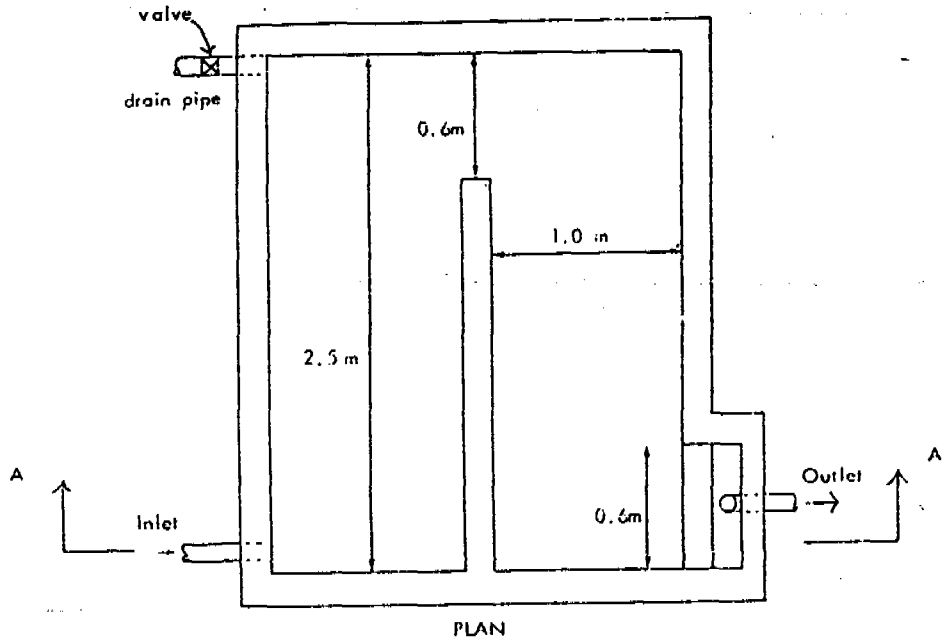
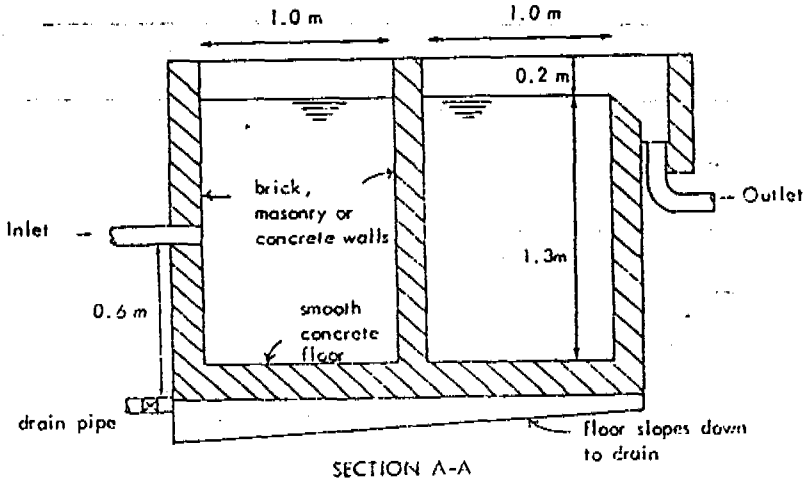


Fig:26-Plain sedimentation with dug basin.





A SIMPLE SEDIMENTATION TANK FOR FLOWS UP TO 2000 Litres/hour.

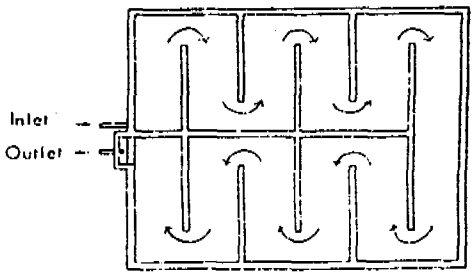
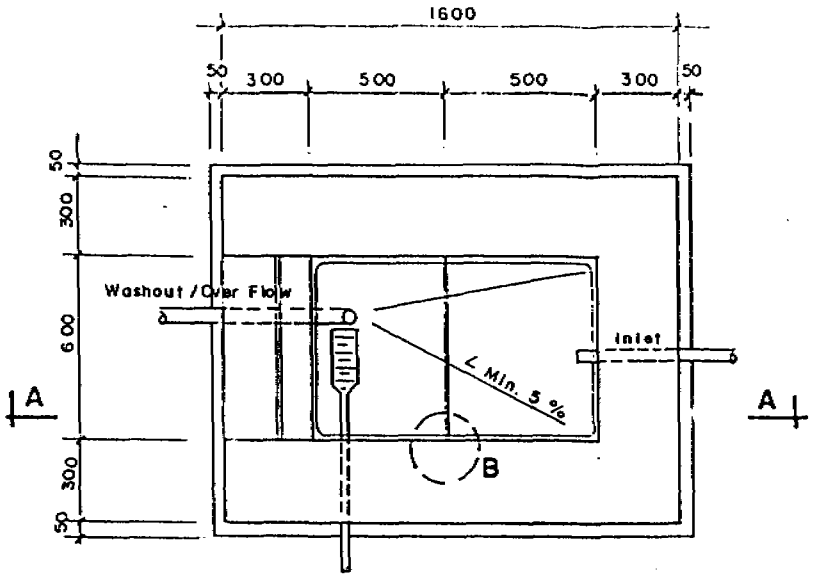
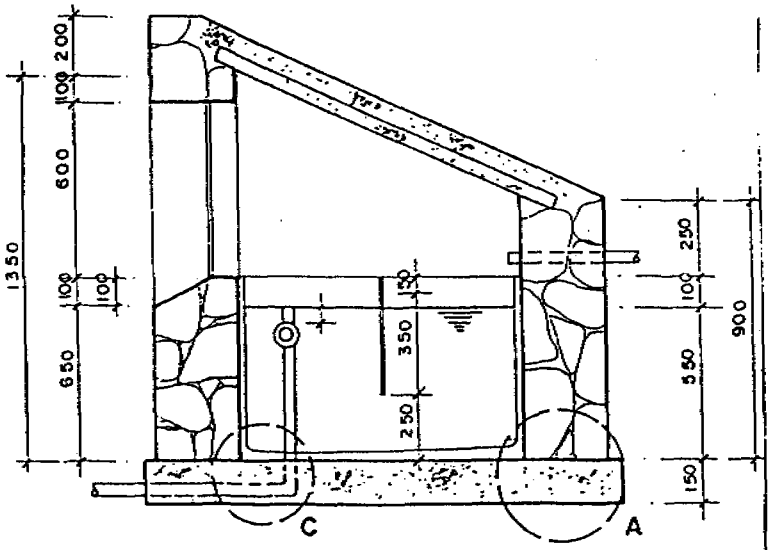


Fig:27 - TYPICAL DETAILS OF MASONARY SEDIMENTATION TANK.

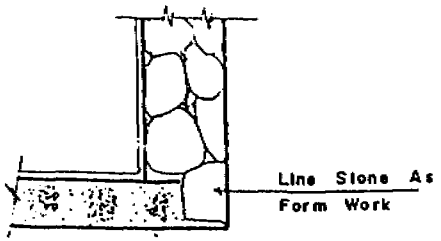


GROUND PLAN

SCALE 1:20



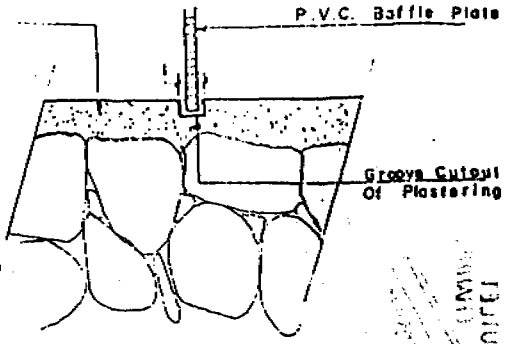
SECTION A-A



DETAIL AT 'A'

OTHER POSSIBILITY FOR FOUNDATION / WALL CONNECTION

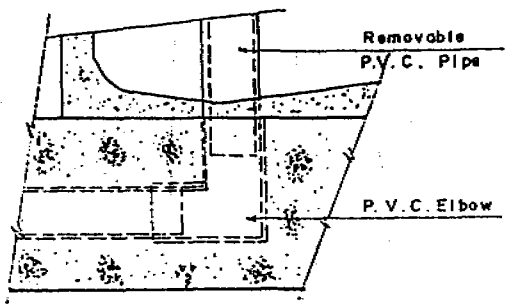
SCALE 1:20



DETAIL AT 'B'

GROOVE FOR BAFFLE PLATE

SCALE 1:5



DETAIL AT 'C'

WASHOUT AND OVERFLOW

SCALE 1:5

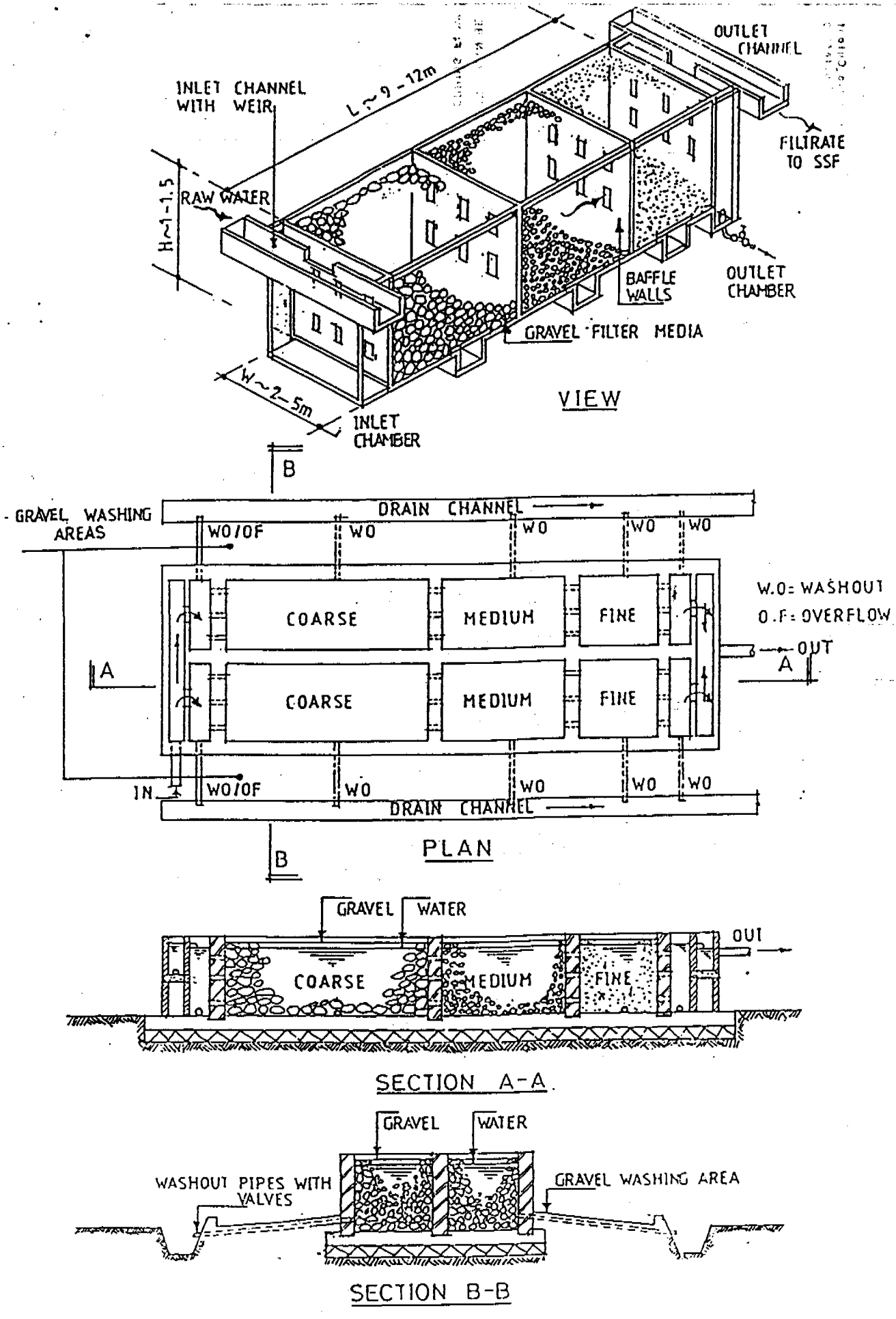
NOTE

THE VOLUME OF THIS SILTBOX CAN BE ALTERED ACCORDING TO THE SPRING FLOW

NOTE

ALL DIMENSIONS ARE IN MILLIMETRE

Fig:28-TYPICAL DETAIL OF SILT BOX.



HORIZONTAL FLOW ROUGHING FILTER

GENERAL LAYOUT

Fig.29.

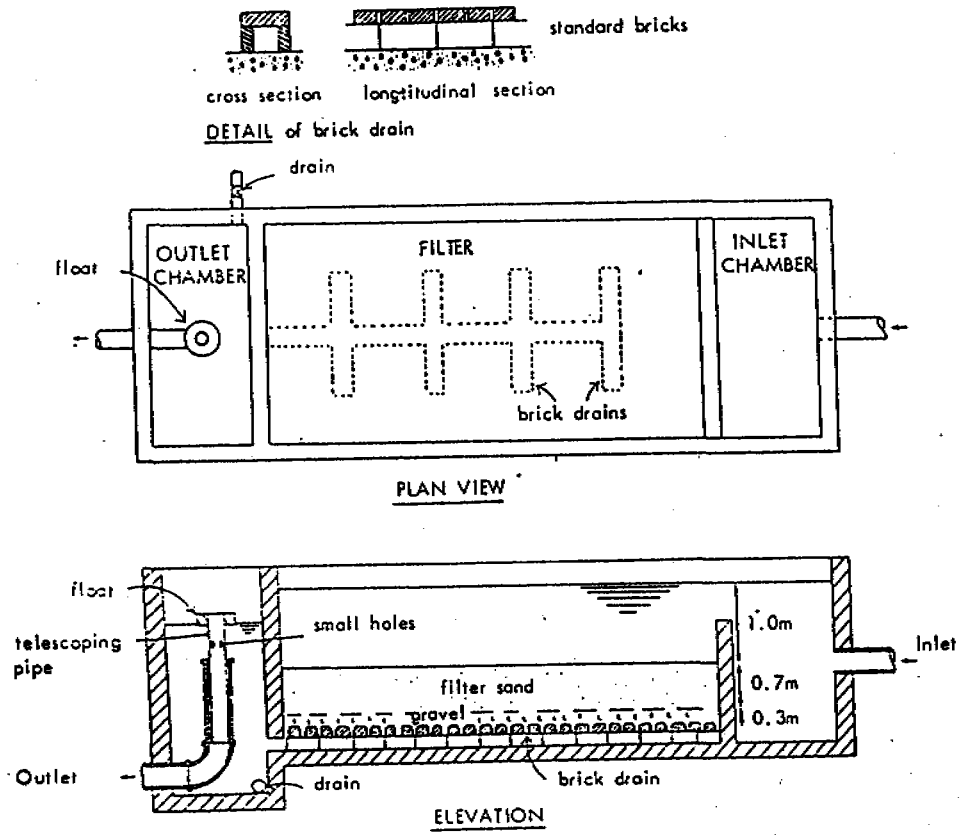


Fig:31 - SLOW SAND FILTER

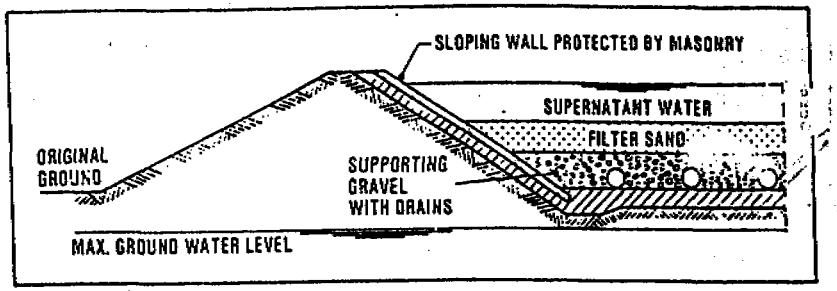


Figure 15.7.
Slow sand filter constructed of masonry on puddled clay

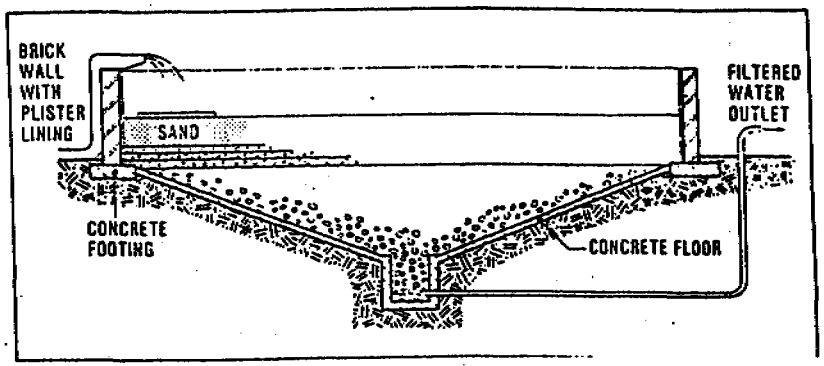


Fig:30 - SIMPLE SLOW SAND FILTER (DETAIL)

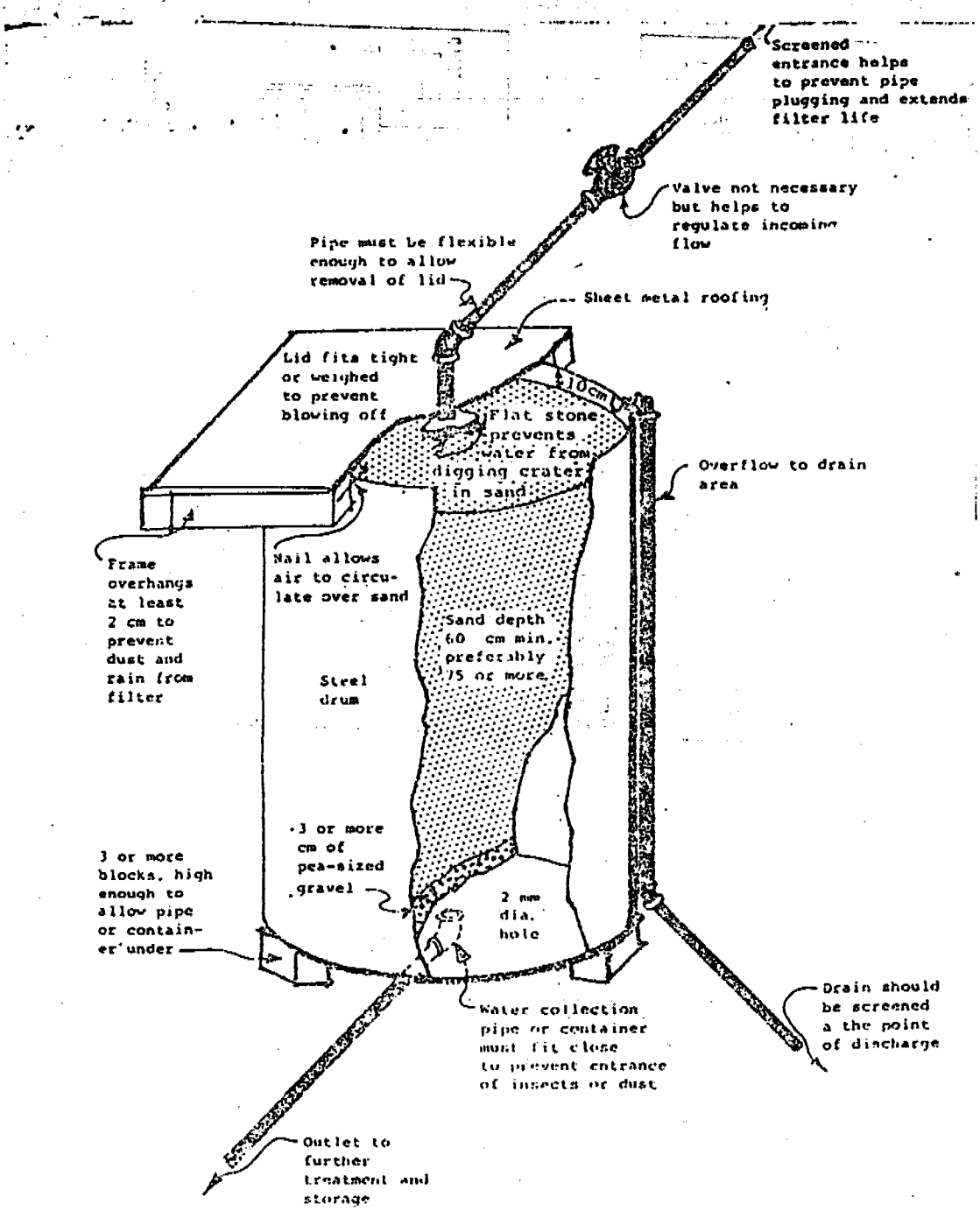
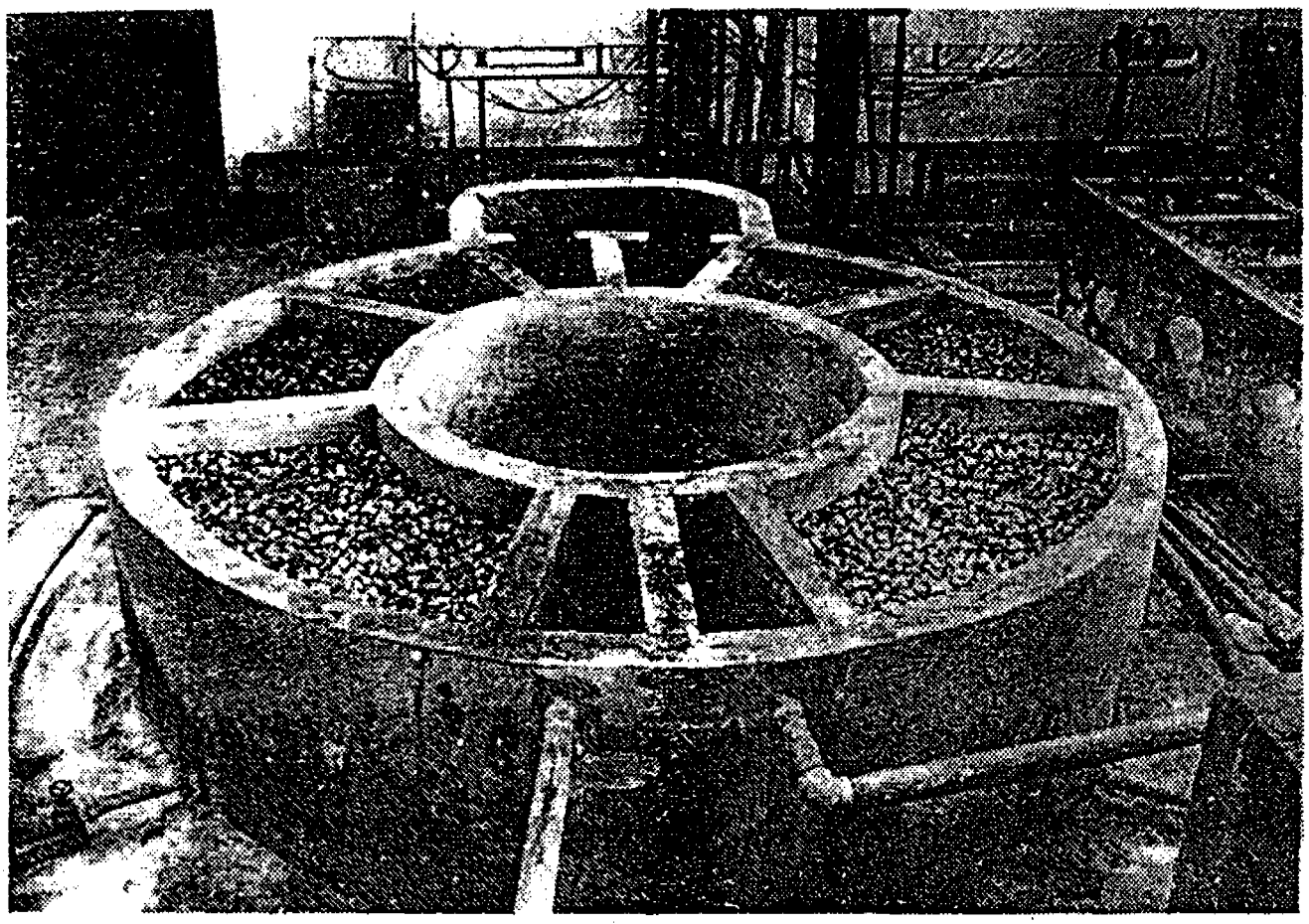


Fig:32 - TRICKLING SAND FILTER



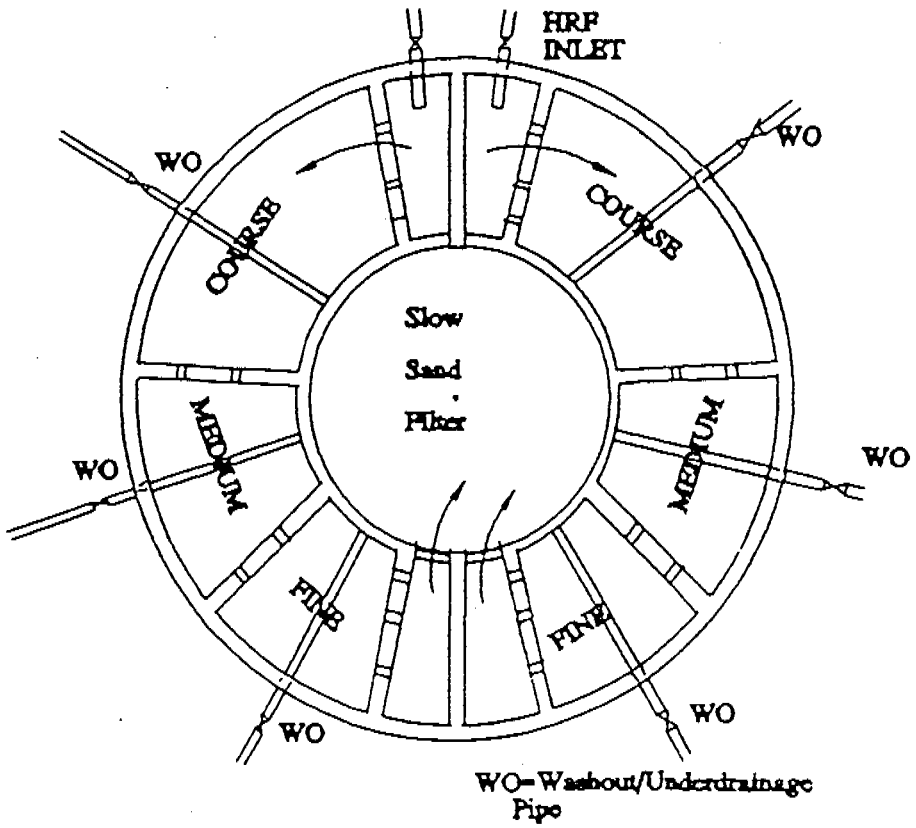

HRF
INLET
WO
WO
COURSE
COURSE
Slow
Sand
Filter
WO
MEDIUM
MEDIUM
WO
FINE
FINE
WO
WO
WO=Washout/Underdrainage
Pipe

Fig - 33

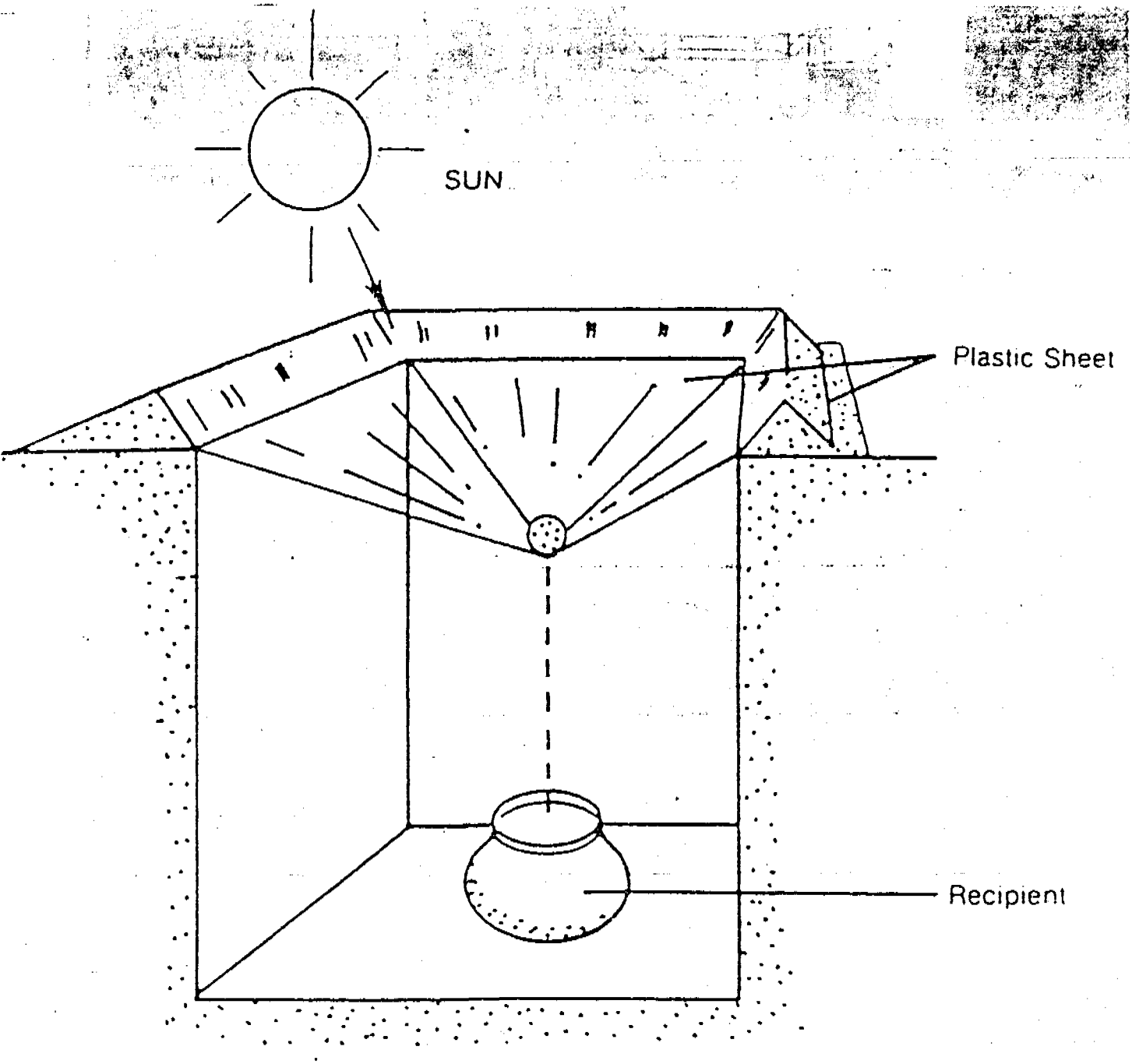


Fig.34-Evaporation/collection of subsurface water,

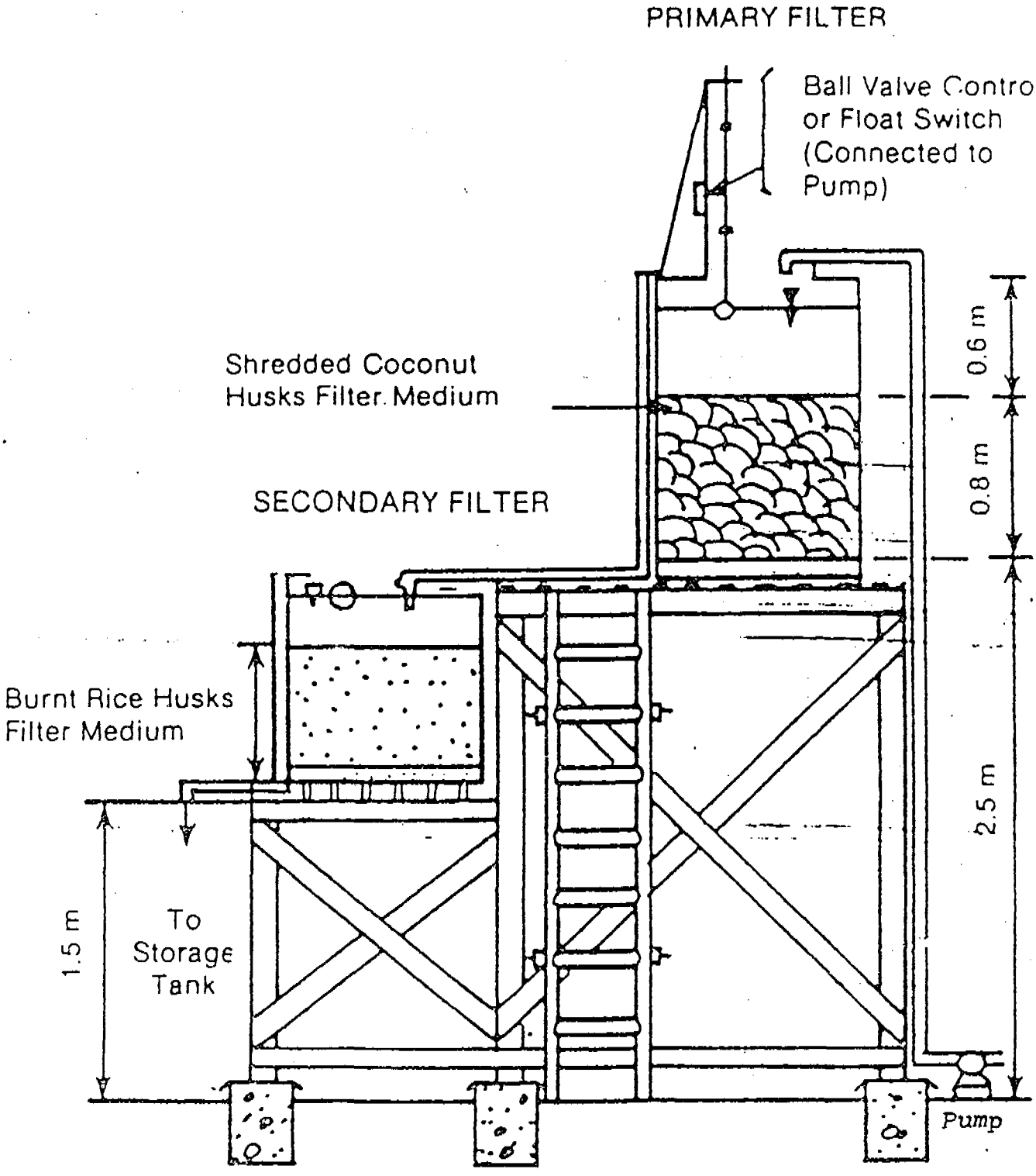
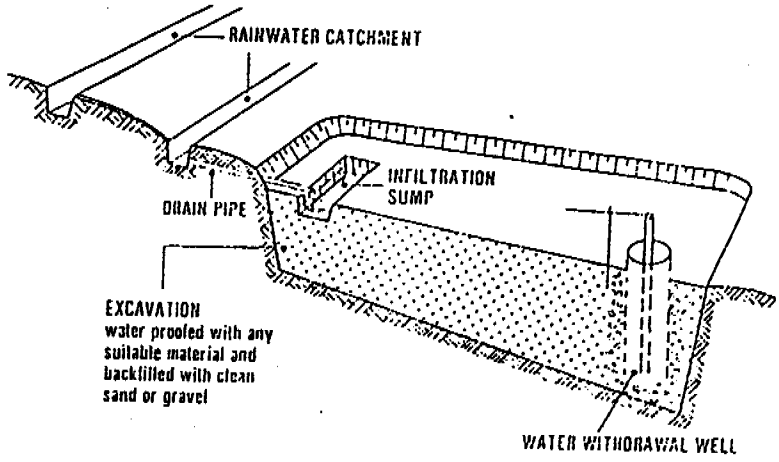
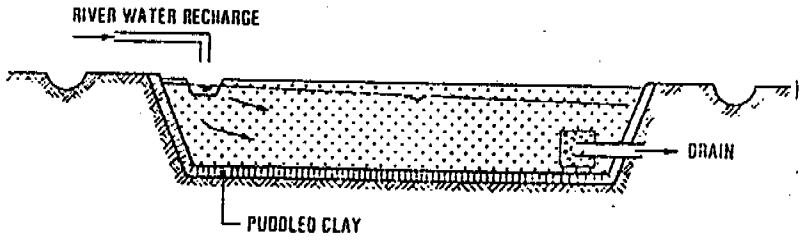


Fig:35 - TWO STAGE FILTERATION UNIT



ARTIFICIAL RECHARGE USING RAINWATER



ARTIFICIAL RECHARGE OF GROUND WATER

Fig:36

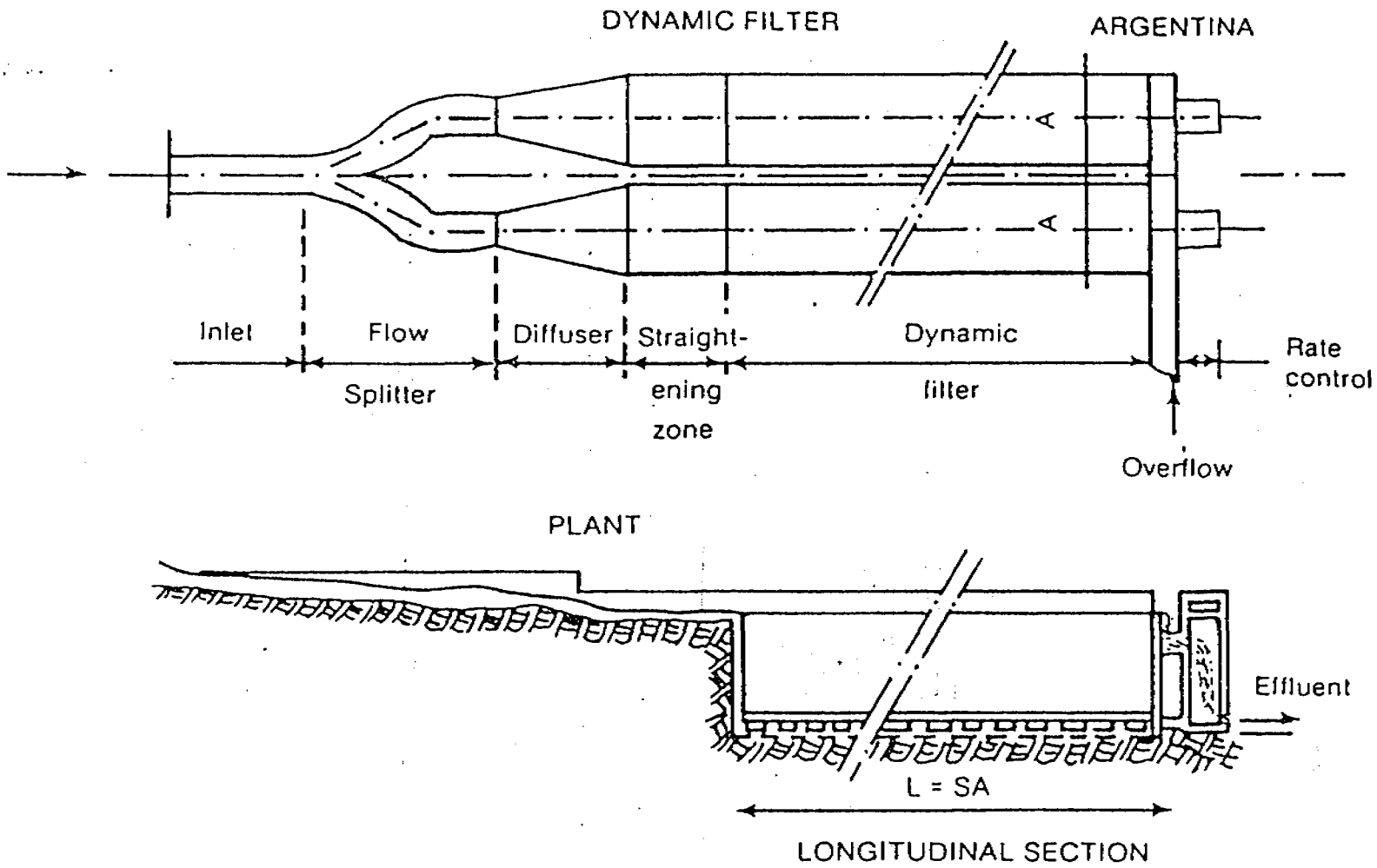
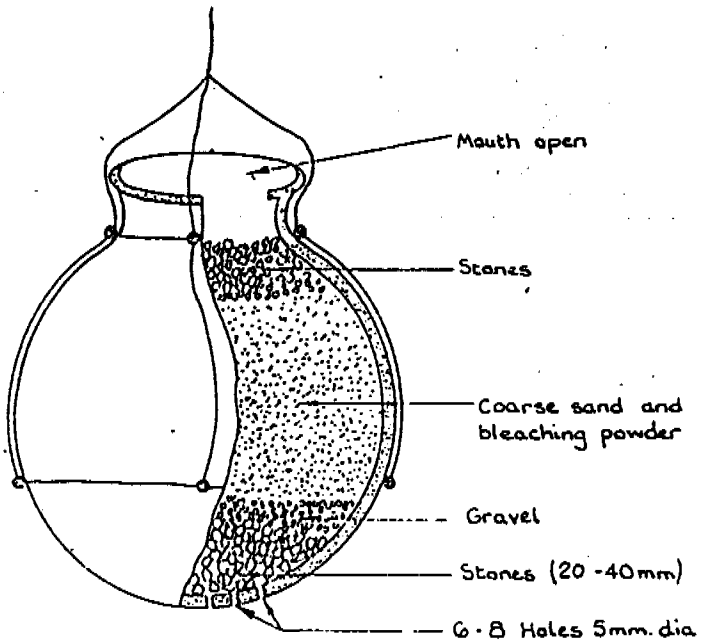
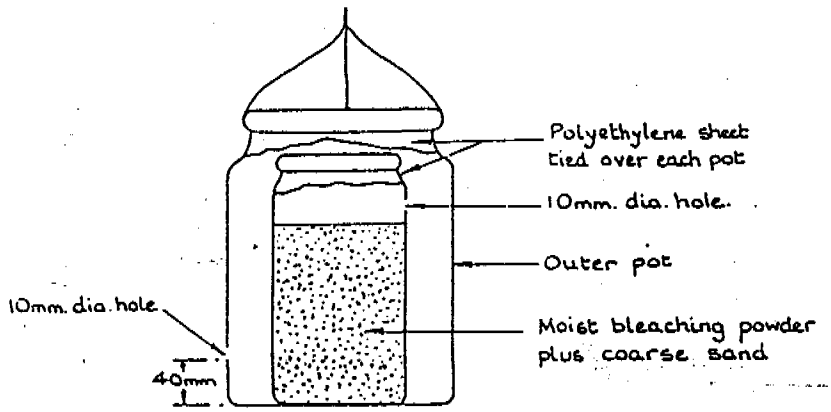


Fig:37- INTAKE DYNAMIC FILTER SYSTEM



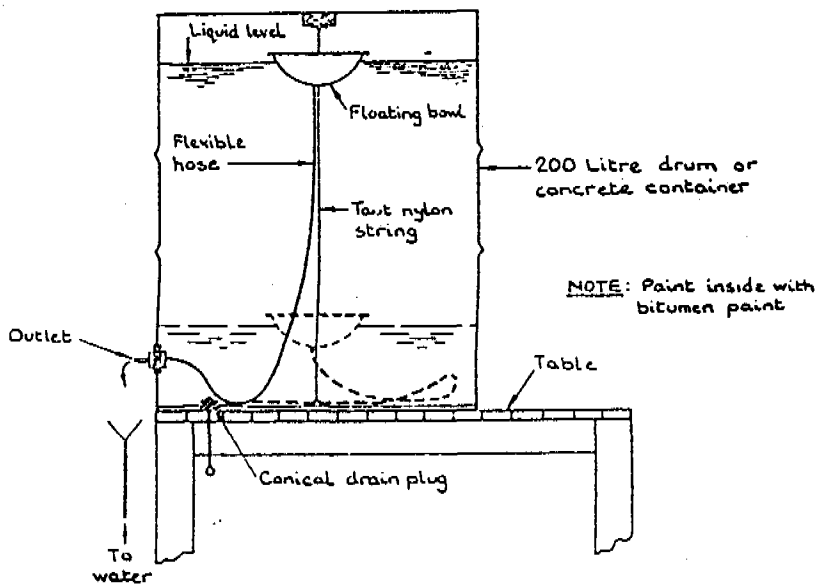
(a) SINGLE POT SYSTEM



(b) DOUBLE POT SYSTEM

Fig - 38

POT CHLORINATION TWO ALTERNATIVE DESIGNS



FLOATING BOWL CHLORINATOR, TO FEED CHLORINE SOLUTION AT A CONSTANT HEAD

Fig - 39

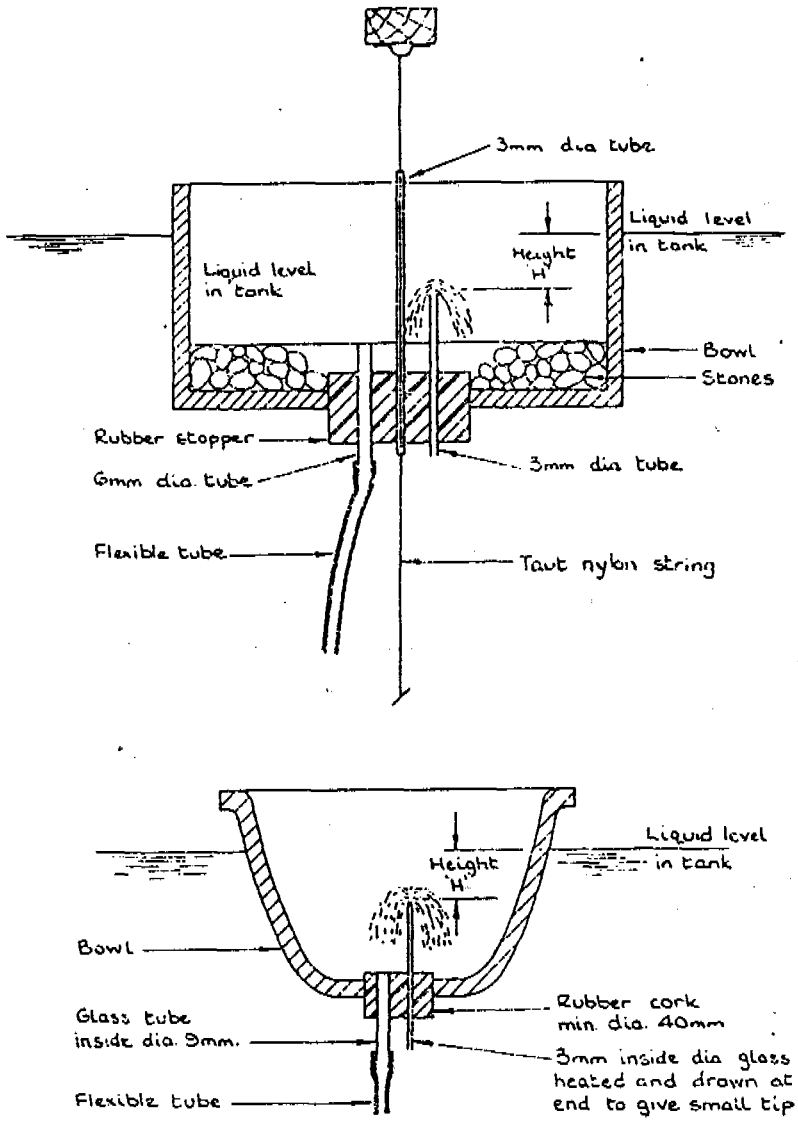


Fig:40 - DETAIL OF FLOATING BOWL; TWO ALTERNATIVE ARRANGEMENTS.

CHLORINATION SYSTEM

Fig. 22

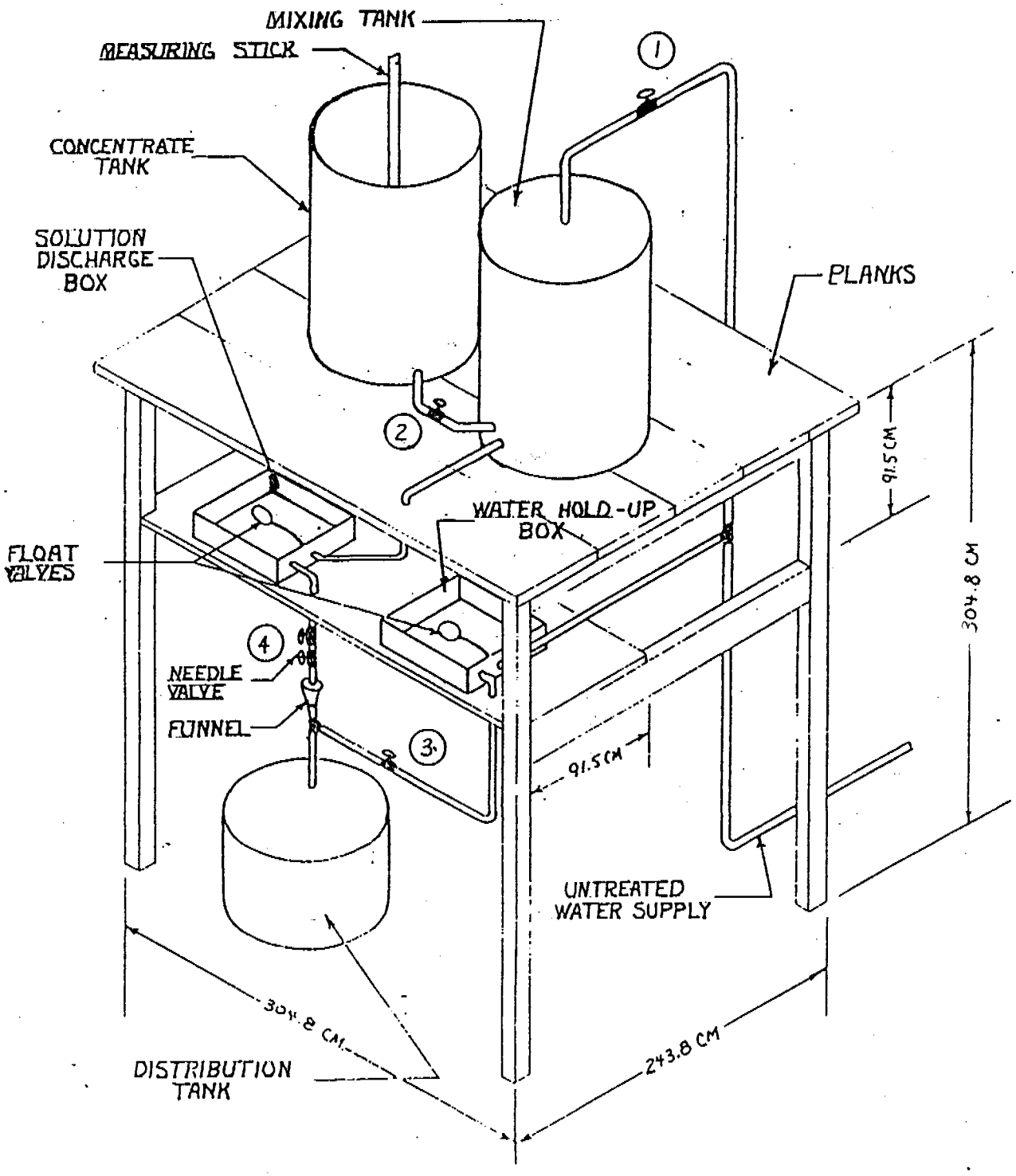


Fig:41- LOW COST CHLORINATION SYSTEM

APPENDIX-3

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

****

NATIONAL WATER SUPPLY AND DRAINAGE BOARD

****

ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.m)
1	Greater Colombo area Sewarage Scheme	Colombo	IDA		16.150
2	Kurunegala WSS (AUG)	Kurunegala	France		12.000
3	Kurunegala WS& San. GTZ	Kurunegala	German		14.200
4	Kandy District WS & San Phase 11	Kandy	Finida		530.000
5	Badulla WS & San (Head work)	Badulla	France		25.000
6	Sri Lanka WS &San. Rehab. Project		IDA		972.670
7	A 4/1 Bulk Meters 1		IDA		0.500
8	A 5 Local Repairs (Valves)		IDA		18.760
9	A 6/1 Stand Posts		IDA		
10	A 7/1 Greter Colombo Distribution 1	Colombo	IDA		
11	Jubelee Pipe Line and Maharagama Distribution	Colombo	IDA		813.880
12	Contract Administration		IDA		65.240
13	7/2 Distribution System R/F Stage 11		IDA		88.000
14	5/2 Local Repairs Reservoirs		IDA		12.500
15	A.34 Mis. Equipment		IDA		22.7
16	Provision for last year payments				42
17	Hill Country Project(Medadumbara, Hatton & Badulla)		UK		60
18	Investigation for WS & San				70
19	Kandy WS & San	Kandy			3.6
20	Wennappuwa WS & San	Puttalam	USAID		1.26
21	Ahangama Ws & San Stage 1	Matara			30.1
22	Kakkapalliya WS & San		USAID		26.3
23	Kheliyagoda WS & San	Ratnapura	USAID		13.7
24	Kahawatta WS & San	Ratnapura	USAID		13.3
25	Ahangama WS & San. Stage 11	Matara			29
26	Deep Well Drilling		Japan		134
27	Deep Drilling In Hard Rock Area				181.55
28	1.5 m. Housing Programme				275
29	ADB WS & Rehabilitation Project		ADB		1127.8
30	Rehabilitation of WS & San				341.94
31	Anuradhapura	Anuradhapura			12.7
32	ADB RWS Sector Development		ADB		
33	Mirigama WS & San Phase 1,11,&111	Gampaha			6.25
34	Ja Ela Gr of towns Ragama Stage 11	Gampaha			18.9
35	A'pura sacred City WS &San	Anuradhapura			2.45
36	Water Supply to Towns East of Colombo	Colombo	JAPAN		704.83
37	Puttlam WS & San	Puttalam	CHINA		192
38	Ambatale Head Works	Colombo	France		776
39	A'pura district WS & San.	Anuradhapura	Danida		74.5
40	Chilaw Ws &San	Puttalam	China		362.3
41	Biyagama Ws & San				185
42	New minor WS. & San and Extentions				20
43	IDA Project 111. (Component)				313.3
44	9/1 Scraping and Relining		IDA		203.9
45	10/2 Maharagama WS Stage 11	Colombo	IDA		75.5
46	4/2 Bulk Meters Stage 11		IDA		23.9

47	Rikilgaskada WS & San	N'Keliya				1
48	Senarathpura	N'Kliya				4.36
49	Mahakudugala Ws & San	N'Kliya				2.72
50	Mundel Ws & San	Puttalam				22.4
51	Mangalaeliya WS & San	Puttalam				12.4
52	Andigama Ws & San (ADB)	Puttalam				6.6
53	Madurankuliya WS & San	Puttalam				10.9
54	Rajakadaluwa Kottage Villaghe Ws&San	Puttalam				7.72
55	Palliyawatta &Battalagunduwa Island	Puttalam				0.7
56	Anavillampattu WS & San (AUG)	Puttalam				1.43
57	Muthupanthiya Village	Puttalam				2.42
58	Madurankuliya Sembuwatta Village	Puttalam				10.92
59	Sirambiyadiya	Puttalam				8.55
60	Kalpitiya-Karakanhuna Talyadi	Puttalam				3.06
61	Kakkapalliya WS & San Stage 11	Puttalam				26.3
62	Wennappuwa WS & San Stage 11	Puttalam				15.1
63	Thumbekaraputugala	Matara				3.2
64	Kirinda Karaputugala & Jumbe Area WS & San	Matara				20.6
65	Hakmana WS & San	Matara				1
66	Morawaka WS & San	Matara				8.75
67	Beralapannanthara	Matara				3
68	Akuress WS & San. Alt. 11	Matara				29.92
69	Panadura Keselwatta	Kalutara				180
70	Matugama WS & San	Kalutara				1.7
71	Kaluamodara moragalla Ws & San	Kalutara				12
72	Beruwala Maggona Extention	Kalutara				23
73	Kandana, Ja Ela, Ragama.	Gampaha				160
75	Katunayake - Seeduwa	Gampaha				5
76	Thiriyaya WS & San	Gampaha				0.5
77	Natukanda	Gampaha				1
78	Yakkala WS & San	Gampaha				18.5
79	Minuwangoda Ws & San	Gampaha				10
80	Manampitiya	Polonnaruwa				1.5
81	Dambulla WS& San	Matale				0.5
82	Palapthwela (AUG)	Matale				1.425
83	Pallepola Ws &San	Matale				3.725
84	Laggala pallegama WS & San	Matale				2.335
85	Hettipola Ws & San stage 1	Matale				2.625
86	Matale Gravity WS & San	Matale				8.954
87	Bambarakirilla WS & San	Matale				10.89
88	Galapitamada WS & San	Kegalle				5
89	Uyanwatta Muslim Village	Kegalle				1
90	Wijayabahukanda WS & San	Kegalle				0.88
91	Hemmathagagama WS & San	Kegalle				13.8
92	Badalkumbura WS & San	Monaragala				1
93	Madagama WS & San Alternative 1	Monaragala				0
94	Madagama WS & San Alternative 2	Monaragala				0
95	Rehabilitation of WS & San. In Monaragala	Monaragala				20
96	Kndana	Ratnapura				2
97	Belihuloya water supply Project	Ratnapura				485
98	Uda Walave Ws & San	Ratnapura				130
99	Borala ExTention from Pelmadulla	Ratnapura				4
100	Godakawela Ws & San	Ratnapura				6
101	Pallebedda Ws & San	Ratnapura				8
102	Kuruwita WS & San	Ratnapura				5
103	Kotawehera Ws & San	Kurunegala				6.3

104	Kobaigane Ws & San	Kurunegala			10.7
105	Wariyapola WS & San	Kurunegala			1.485
106	Mattegama WS & San	Kurunegala			1.8
107	Kuliyapitiya Town WS & San	Kurunegala			3.6
108	Mihirigama WS & San	Kurunegala			7.6
109	Panliyadda WS & San Stage 11	Kurunegala			5.271
110	Alwwa Over Head Tank Rehabilitation	Kurunegala			2.8
111	Buluwala Tank Rehabilitation	Kurunegala			1.8
112	Ogodapola Reservoir Rehabilitation	Kurunegala			1
113	Pugoda Intake Well Rehab.	Kurunegala			5
114	Ladegama	Badulla			2
115	Kebellewela (North)	Badulla			1.5
116	Ambagasdowa	Badulla			14
117	Banarawela, Diyatalaea, Haputale Integrated WSS	Badulla			520
118	Beliatta WS & San	Hambantota			25
119	Wellawaya Road	Hambantota			4
120	Kirinda Ws & San	Hambantota			20
121	Kirama Walasmulla WS & San	Hambantota			25
122	Weeraketiya Ws & San	Hambantota			20
123	Angunakolapelessa WS & San	Hambantota			18
124	Sooriyawewa WS & San	Hambantota			75
125	Katuwana Stage 11 WS & San	Hambantota			8.3
126	Mamadala WS & San	Hambantota			55
127	Kattakaduwa Village WS & San	Hambantota			0.8
128	Pahalkagama WS & San	Hambantota			1.2
129	Middeniya Stage 11WS & San	Hambantota			0
130	Bandahiriya WS & San	Hambantota			32
131	Weerawila - Telulla	Hambantota			3
132	Weligatta - Pallemulla	Hambantota			2.3
133	Elpitiya	Galle			16
134	Imaduwa	Galle			5
135	Neluwa	Galle			17
136	Ambalangoda, Kosgoda WS & San	Galle			6.4
137	Ambalangoda, Hikkaduwa WS & San	Galle			20
138	Thotagoda , Akmeemana WS & San	Galle			6
139	Hapugala , Wakwella WS & San	Galle			6
140	Imaduwa WSS	Galle			14.07
141	Elpitiya WSS	Galle			46.84
142	Ahangama WSS	Galle			39.7
143	Neluwa Town WS & San	Galle			7.6
144	Rehab. In WS & San. In baticaloa Dist,	Baticaloa			20
145	Trincomalee WS & San	Trincomalee			5.5
146	Andankulam - Chinabay WS & San	Trincomalee			5
147	Venorasampur - Kantalai WSS	Trincomalee			3
148	Nilaveli - sampalthevu WS & San	Trincomalee			10
149	Kinnia WS & San	Trincomalee			10
150	96 Mile Post WS & San	Trincomalee			5
151	Allainagar WS & San	Trincomalee			5
152	Mutur Ws & San	Trincomalee			5
153	Appuvallipuram Ws & S	Trincomalee			5
154	Rehab. of WS & San In Trinco District	Trincomalee			20
155	Vellaimanal Dist. System	Trincomalee			3
156	Cistern & Taps Kandy Road System	Trincomalee			2
157	Andankulam Tank Complex (Rehab.)	Trincomalee			2
158	Nilawely tank complex	Trincomalee			5
159	Kanthalai Pumping Station (Rehab.)	Trincomalee			5

160	Thoppur (Investgation Survey)	Trincomalee				0.5
161	Mullative Ws & San	Mullaitivu				40
162	Mankulam WS & San	Mullaitivu				10
163	Muliyawalai	Mullaitivu				10
164	Mullaitivu town WS (Invest, & Survey)	Mullaitivu				0.5
165	Thavunkai Town (Investigation & Survey)	Mullaitivu				0.25
166	Marukandy Ws	Kilinochchi				5
167	Marukandy Sewage and Toilets	Kilinochchi				1
168	KIlinochchi WSS (Rehab)	Kilinochchi				15
169	Nedunkerni WSS (Rehab)	vavuniya				1
170	Chandikulam (Invst. & Survey)	Vavuniya				0.25
171	Peliyagoda Integrated project	Colombo				14.48
172	Attidiya Development Scheme	Colombo				33.09
173	Greater Colombo Area WS & Sew. Stage 11	Colombo				10
174	WS & San Cordination unit project	Colombo				1.01
175	Management info. system NWS&DB	Colombo				2.45
176	Replacement of Deteriorated	Colombo				100
177	Improvement to Existing WSS	Colombo				110
178	Scraping Relaying Of Transmission Mains	Colombo				400
179	Labugama and Kalatuwawa	Colombo				8.9
180	Rehab. of AmbataleWSS	Colombo				360
181	Rehab. of Groud Water Wells	Colombo				25
182	Tube Well Maintenance	Colombo				2.5
183	Drill Rig Maintenance	Colombo				3.42
184	Hasalaka WSS Augmentation	Kandy				10.4
185	Ududumbara WSS	Kandy				1.08
186	Kundasale WSS	Kandy				53.5
187	Thalathu Oya WS & San Extension	Kandy				5.3
188	Puliyadda - ThalathuoyaWs & San.	Kandy				6.4
189	Hantana Estate WS&S	Kandy				3.62
190	Hendunuwewa WS & S	Kandy				4
191	Sapugastalawa WS & S	Kandy				5.44
192	Ambalakanda WS & S	Kandy				2.47
193	Ududumbara WS & S (Balance Work)	Kandy				4.5
194	Yahalatenna WS & S	Kandy				1.11
195	Doluwa Ws & S (Revised) Stage1	Kandy				2
196	Doluwa Ws & S (Revised) Stage11	Kandy				0.5
197	Doluwa Ws & S (Revised) Stage111	Kandy				0.95
198	Uyanwatta Ws&S	Kandy				0.5
199	Heerassagala WS & S	Kandy				1.48
200	Athgala Ws & S (Rehb)	Kandy				0.88
201	Mariyawatta Ws & s (Rehab)	Kandy				1.2
202	Udatenna WS & S (Rehab) Balagala WS & S (Rehab)	Kandy				1.5
203	Polgolla	Kandy				4.6
204	Dambulla	Kandy				1.4
205	Naula	Kandy				4.1
206	Hantana	Kandy				3.1
207	Mullepihilla	Kandy				1.2
208	Matale(Rehab)	Kandy				2
209	Kadugannawa (Rehab)	Kandy				0.3
210	KundasaleWs	Kandy				0.8
211	Udunuwara - Yatinuwara (rehab)	Kandy				2
212	Kandy (Rehab) Phase 11	Kandy				1004
213	Nawalapitiya (Rehab)	Kandy				200
214	RWS Kandy Distrct	Kandy				233
215	Rehab Of WSS Kandy District	Kandy				75.28

216	Hasalaka WSS	Kandy				80
217	Talawa WSS	A'pura				80
218	A'pura	A'pura				10.4
219	A'pura augmentation	A'pura				7.5
220	Galenbindunuwewa WS Aug.	A'pura				56
221	Vijithapura Viharaya WSS	A'pura				753
222	Pandulagama Surface Drainage	A'pura				4.5
223	Niraviya WS & S	A'pura				10
224	Eppawala Ws & S (Rehab)	A'pura				1.24
225	Kahatagasdigiliya WSS (Rehb.)	A'pura				20
226	Sacred City WS (Rehab)	A'pura				2.1
227	Mihintale WS& S (Rehab)	A'pura				1.9
228	Kekirawa Ws& S Rehab	A'pura				4.4
229	Habarana (Rehb)	A'pura				1.6
230	Rehb of Rural Schemes In A'pura District	A'pura				1.8
231	Sammanturai WSS	Amparai				5.6
232	Amparai WS Phase 111	Amparai				40
233	Amparai WSS Phase 11	Amparai				93
234	Rehab of Rurl WSS iN Amparai	Amparai				84
235	Inginimitiya (Rehab)	Amparai				76
236	Uhana (Rehab)	Amparai				20
238	Unit 21 wss (rehab)	Amparai				0.45
239	Kalmunai WSS (Rehab)	Amparai				1.02
240	Mahaoya WSS (Rehab)	Amparai				0.19
241	Batticaloa wss (Rehab)	Amparai				0.29
242	Katunkudy	Amparai				0.08
243	Keppetipola	Bandarawela				0.08
244	Welimada	Bandarawela				2.25
245	Madawela	Bandarawela				4.4
246	Boralanda	Bandarawela				3.2
247	Digantenna	Bandarawela				7
248	Hali - Ela	Bandarawela				5
249	Kandeketiya	Bandarawela				2
250	Wellawaya	Bandarawela				
251	Quarters (Rehab)	Bandarawela				3
252	Vankalai Distribution System	Mannar				10
253	Adampan Distribution System	Mannatr				10
254	Mannar Town Wss (Rehab)	Mannar				2.5
255	Talaimannar WSS Rehab	Mannar				1

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

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JANATHA ESTATE DEVELOPMENT BOARD

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ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.m)
1	Ambadeniya State Wwlikanda Div. W.S.& S.	Avissawella		462	0.880
2	Atale State Dikhena Div. W.S.& S.	Avissawella		231	0.550
3	Kadell State Orange Grow Div W.S.& S.	Avissawella		149	0.310
4	Miyanawita State Western Div. W.S.& S.	Avissawella		665	1.170
5	Weoya State Ajmeer Div. W.S.&.S.	Avissawella		176	0.460
6	Urumiwala State Makawilla Div. W.S.& S.	Avissawella		160	0.440
7	Anhettigama State Lassanagama Div. W.S.& S.	Avissawella		231	0.460
8	Udabage State Middle Div. W.S.& S.	Avissawella		357	0.630
9	Sapumalkanda State Clunes Div. W.S.& S.	Avissawella		286	0.550
10	panawatte State Degallessa / 1 Div. W.S.& S.	Avissawella		594	0.930
11	Elston State Upper Div. W.S.& S.	Avissawella		390	0.680
12	Ayr State Ayr Div. W.S.& S.	Avissawella		121	0.330
13	Yatideriya StateNorthbook Div. W.S.& S.	Avissawella		726	1.730
14	Udapola State Udakelle Div. W.S.& S.	Avissawella		110	0.430
15	Atale State Maboda Div. W.S.& S.	Avissawella		176	0.53
16	Weoya State Upper Div. W.S.& S.	Avissawella		451	0.99
17	Urumiwala State Managalla Div. W.S.& S.	Avissawella		132	0.45
18	Anhettigama State Velhinda Div W.S.& S.	Avissawella		121	0.44
19	Miyanawita State KOSGAHAKANDA div. W.S.& S.	Avissawella		935	1.9
20	Mahaoya State Mahaoya DIV. W.S.& S.	Avissawella		698	0.98
21	Sapumalkanda State DIggala Div. W.S.& S.	Avissawella		99	0.58
22	Panawatts State Degallessa / M Div. W.S.& S.	Avissawella		99	0.39
23	Synnycroft State Singrawatte Div.W.S.& S.	Avissawella		253	0.963
24	Elston State Lower Div. W.S.& S.	Avissawella		308	0.84
25	Deteloya State Alikedenniya Div. W.S.& S.	Avissawella		110	0.47
26	Atale State Oldaranndara Div. W.S.& S.	Avissawella		121	0.49
27	Halgolla State Punugala Div. W.S.& S.	Avissawella		875	1.74
28	Urumiwala State Urimiwala Div. W.S.& S.	Avissawella		253	0.68
29	Maliboda State Factory Div. W.S.& S.	Avissawella		352	0.78
30	Udabage State Upper Div. W.S.& S.	Avissawella		462	0.94
31	Sapumalkanda State Digala Div. W.S.& S.	Avissawella		907	1.63
32	Dewalakanda Dunedin Div. W.S.& S.	Avissawella		352	0.77
33	Kitulgala State Yahinda Div. W.S.& S.	Avissawella		352	0.77
34	Vincit State Vincit Div. W.S.& S.	Avissawella		396	0.84
35	Halpe State Halpe Div. W.S.& S.	Avissawella		467	0.95
36	Siriniwansa State Lower Div. W.S.& S.	Avissawella		181	0.5
37	Doteloya State Alikedeniya Div. W.S.& S.	Avissawella		110	0.51
38	Kdalla State Orange Grove Div. W.S.& S.	Avissawella		149	0.57
39	Atale State Dropet Div. W.S.& S.	Avissawella		110	0.49
40	Weoya State Ajmeer Div. W.S.& S.	Avissawella		176	0.62
41	Urumiwala State Urumiwala Div. W.S.& S.	Avissawella		253	0.75
42	Maliboda State Factory Div. W.S.& S.	Avissawella		808	0.9
43	Miyanawita State Eastern Div. W.S.& S.	Avissawella		555	1.14
44	Sapumalkanda State Sapumalkanda Div. W.S.& S.	Avissawella		671	1.32

45	Panawatte State Panawatte Div. W.S.& S.	Avissawella		594	1.19
46	Chesterford State Chesterford Div. W.S.& S.	Avissawella		484	1.02
47	Sunney Croft State Stinsford Div. W.S.& S.	Avissawella		209	0.58
48	Halpe state Melborne Div W.S.& S.	Avissawella		253	0.65

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

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SRI LANKA STATE PLANTATION CORPORATION.

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ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.m)
1	Udaweriya State Latrine Project	Haputale	MITP	1287	0.311
2	Alton State WSS	Hatton	MITP	2372	0.190
3	Carolina State WSS	Hatton	MITP	2515	0.070
4	Fetteresso State WSS	Hatton	MITP	1784	0.350
5	Kotiyagala State WSS	Hatton	MITP	3863	0.550
6	Laxapana State WSS	Hatton	MITP	3724	0.230
7	Moray State WSS	Hatton	MITP	2352	0.960
8	Norwood State WSS	Hatton	MITP	3126	0.340
9	Poyston State WSS	Hatton	MITP	1713	0.210
10	Strathpey State WSS	Hatton	MITP	3509	0.450
11	Venture State WSS	Hatton	MITP	2230	0.450
12	Bogawantalawa State Latreine Project	Hatton	MITP	2642	0.240
13	Campion state Latrine Project	Hatton	MITP	2758	0.260
14	Kew State Latrine Project	Hatton	MITP	2416	0.240
15	Norwood State Latrine Project	Hatton	MITP	1392	0.26
16	Mahanilu State Latrine Project	Hatton	MITP	3126	0.31
17	Clarenden State WSS	N'Kliya	MITP	1365	0.342
18	Concordia State WSS	N'Kliya	MITP	3845	0.024
19	Court Lodge State WSS	N'Kliya	MITP	3200	0.22
20	Glassaugh State WSS	N'Kliya	MITP	1441	0.66
21	Nuara Kliya State WSS	N'Kliya	MITP	3765	0.92
22	Ouvahkellie state WSS	N'Kliya	MITP	1084	0.48
23	Pedro State WSS	N'Kliya	MITP	3484	0.12
24	Park State WSS	N'Kliya	MITP	2200	0.04
25	Radella State WSS	N'Kliya	MITP	2261	0.42
26	St. Clair State WSS	N'Kliya	MITP	2189	1.04
27	Talawakelle State WSS	N'Kliya	MITP	2682	1.08
28	Uda Radella State WSS	N'Kliya	MITP	1273	0.02
29	Claranden State Latrine Project	N'Kliya	MITP		0.31
30	Concordia State Latrine Project	N'Kliya	MITP		0.14
31	Court Lodge State Latrine Project	N'Kliya	MITP		0.29
32	Plmerston State Latrine Project	N'Kliya	MITP	1278	0.21
33	Pedro State Latrine Project	N'Kliya	MITP		0.29
34	Uda Radella State Latrine Project	N'Kliya	MITP		0.04
35	Nankadawala well project	N'Kliya	MITP		
36	Arapolakande State WSS	Kalutara	MITP	1025	0.35
37	Clide State WSS	Kalutara	MITP	524	0.11
38	Calluden State WSS	Kalutara	MITP	1840	0.95
39	Dalkeith State WSS	Kalutara	MITP	1983	0.06
40	Kladuwa State WSS	Kalutara	MITP	1182	0.05
41	Frocester State WSs	Kalutara	MITP	816	0.425
42	Gikiyanakande State WSS	Kalutara	MITP	2334	0.15
43	Kiriwanketiya State WSS	Kalutara	MITP	942	0.22
44	Millakanda State WSS	Kalutara	MITP	1558	0.12

45	Mirishena State WSS	Kalutara	MITP	489	0.3
46	Neuchetel State WSS	Kalutara	MITP	1710	0.4
47	Paiyagala State WSS	Kalutara	MITP	535	0.25
48	Pimbura State WSS	Kalutara	MITP	362	0.25
49	Pearth State WSS	Kalutara	MITP	1179	0.13
50	Sirikendura State WSS	Kalutara	MITP	626	0.3
51	Sorana State WSS	Kalutara	MITP	1008	0.1
52	Vogan State WSS	Kalutara	MITP	1741	0.46
53	Yatadola State WSS	Kalutara	MITP	1039	0.55
54	Ambetenna State Lp	Kalutara	MITP	1014	0.11
55	Kdurugala State Latrine Project	Kalutara	MITP	722	0.13
56	Kladuwa State Latrine Project	Kalutara	MITP	1182	0.33
57	Gikiyanakanda State Latrine Project	Kalutara	MITP	2334	0.39
58	Thiriwanaketiya State Latrine Project	Kalutara	MITP	542	0.1
59	Millakanda State Latrine Project	Kalutara	MITP	1558	0.14
60	Millewa State Latrine Project	Kalutara	MITP	262	0.14
61	Mirishena State Latrine Project	Kalutara	MITP	489	0.14
62	Pallegoda State Latrine Project	Kalutara	MITP	1353	0.23
63	Raigam State Laterine Project	Kalutara	MITP	1936	0.28
64	Sirakandura State Latrine Project	Kalutara	MITP	625	0.11
65	Uskvalley State Latrine Project	Kalutara	MITP	817	0.13
66	Vogan State Latrine Project	Kalutara	MITP	1741	0.15
67	Yatadola State Latrine Project	Kalutara	MITP	1039	0.14
68	Devinuara state WSS	Galle	MITP	1591	0.6
69	Ellakanda State WSS	Galle	MITP	308	0.23
70	Gulugahakanda State WSS	Galle	MITP	378	0.3
71	Habarakada State WSS	Galle	MITP	803	0.3
72	Homadola State WSS	Galle	MITP	1590	0.45
73	Hayes State WSS	Galle	MITP	1380	0.18
74	Igalkanda State WSS	Galle	MITP	359	0.14
75	Ketandola StateWSS	Galle	MITP	991	0.3
76	Lankaberiya State WSS	Galle	MITP	352	0.01
77	Mapalgama State WSS	Galle	MITP	281	0.4
78	Nagopda State WSS	Galle	MITP	246	0.2
79	Stokesland State WSS	Galle	MITP	406	0.14
80	Talangaha State WSS	Galle	MITP	2153	0.54
81	Thalgaswela State WSS	Galle	MITP	1841	0.99
82	Walahanduwa State WSS	Galle	MITP	526	
83	Walpita State WSS	Galle	MITP	378	0.71
84	Baddegama State Latrine Project	Galle	MITP		0.09
85	Didenipotha State Latrine Project	Galle	MITP	367	0.06
86	Devinuara state LP	Galle	MITP	1591	0.08
87	Ellakanda State LP	Galle	MITP	208	0.3
88	Gulugahakanda State LP	Galle	MITP	378	0.21
89	Habarakada State LP	Galle	MITP	803	0.14
90	Homadola State LP	Galle	MITP	190	0.21
91	Hayes State LP	Galle	MITP	1380	0.86
92	Igalkanda State LP	Galle	MITP	359	0.56
93	Ketandola StateLP	Galle	MITP	991	0.14
94	Lelwala State LP	Galle	MITP	354	0.14
95	Mapalgama State lp	Galle	MITP	281	0.28
96	Monroviya StateLP	Galle	MITP	245	0.28
97	Stokesland State LP	Galle	MITP	406	0.07
98	Talgaswela State Lp	Galle	MITP	1841	0.08
99	Walahanduwa State Lp	Galle	MITP	526	0.77

100	Walpita State LP	Galle	MITP	378	0.07
101	Alupola State WSS	Ratnapura	MITP	2118	0.07
102	Delgoda State WSS	Ratnapura	MITP		0.35
103	Durumpitiya State WSS	Ratnapura	MITP	791	0.03
104	Kndane State WSS	Ratnapura	MITP	4242	0.17
105	Houpe State WSS	Ratnapura	MITP	3111	0.4
106	Hapugastenna State WSS	Ratnapura	MITP	5195	0.3
107	Hunuwella State WSS	Ratnapura	MITP	1816	0.15
108	Kiribathgalla State WSS	Ratnapura	MITP	1192	0.29
109	Kuttapitiya State WSS	Ratnapura	MITP	828	0.22
110	Palmgarden State WSS	Ratnapura	MITP	2535	0.39
111	Peenkanda State WSS	Ratnapura	MITP	1770	0.7
112	Poranuwa State WSS	Ratnapura	MITP	2219	0.6
113	Rye State WSS	Ratnapura	MITP	1817	0.31
114	Walaboda State WSS	Ratnapura	MITP	713	0.15
115	Allerton State Lp	Ratnapura	MITP	764	0.3
116	Kheliyagoda State LP	Ratnapura	MITP	915	0.14
117	Ekkerella State LP	Ratnapura	MITP	790	0.21
118	Keragala State LP	Ratnapura	MITP	797	0.36
119	Lellopitiya State LP	Ratnapura	MITP	2009	0.16
120	Mahawela StateLP	Ratnapura	MITP	1850	0.23
121	Nirilla State LP	Ratnapura	MITP	2029	0.57
122	Opatha State LP	Ratnapura	MITP	3132	0.66
123	Peenkanda State LP	Ratnapura	MITP	1770	0.43
124	Pussella State LP	Ratnapura	MITP	668	0.2
125	Rilhena State Lp	Ratnapura	MITP	2608	0.23
126	Raassagala State LP	Ratnapura	MITP	2189	0.35
127	Springwood State LP	Ratnapura	MITP	1977	0.73
128	Wellandura State Lp	Ratnapura	MITP	2414	0.02
129	Cottaganga State WSS	Matale	MITP	1430	0.14
130	Duckwari State WSS	Matale	MITP	1385	0.26
131	Galphele State WSS	Matale	MITP	1762	0.3
132	Gammaduwa State WSS	Matale	MITP	1170	0.44
133	Gomara State WSS	Matale	MITP	1368	0.06
134	Harepoark State WSS	Matale	MITP	1793	0.44
135	Hapugaspitiya State WSS	Matale	MITP	619	0.39
136	Lebanon State WSS	Matale	MITP	841	0.32
137	Rangalla State WSS	Matale	MITP	2151	0.32
138	Woodside State WSS	Matale	MITP	1361	0.52
139	Yatawatte State WSS	Matale	MITP	791	0.2
140	Cotaganga State LP	Matale	MITP	1430	0.67
141	Goomera State LP	Matale	MITP	1368	0.28
142	Kallebokka State LP	Matale	MITP	4610	2.33
143	Millawana State Lp	Matale	MITP	606	0.16
144	Rangalla State LP	Matale	MITP	2151	0.45
145					

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

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DANIDA.

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ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.m)
1	Kebithigollawa Water Supply Scheme	A'PURA	DANIDA	619	
2	Horowpathana Water Supply Scheme	A'PURA	DANIDA	465	
3	Galinbidunuwewa Water Supply Scheme	A'PURA	DANIDA	416	
4	Nochchiyagama Water Supply Scheme	A'PURA	DANIDA	768	
5	Kahatagasdigiliya Water Supply Scheme	A'PURA	DANIDA	2750	
6	Maradankadawala Water Supply Scheme	A'PURA	DANIDA	585	
7	Galnewa Water Supply Scheme	A'PURA	DANIDA	288	
8	Thambuttegama Water Supply Scheme	A'PURA	DANIDA	1008	
9	Mihintale Water Supply Scheme	A'PURA	DANIDA	3397	
10	Eppawala Water Supply Scheme	A'PURA	DANIDA	2982	
11	Kekirawa Water Supply Scheme	A'PURA	DANIDA	72	

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

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FINIDA.

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ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.m)
1	Pipe laying Udunuwara-Yatinuwara	Kandy	FINIDA		1.500
2	Pipe laying Hampitiya, Kiahetta, Dalugala	Kandy	FINIDA		0.900
3	Akurana WSS Stage1	Kandy	FINIDA		1.700
4	Akurana WSS Stage11	Kandy	FINIDA		0.225
5	Consolidation of Kondadiniya WSS	Kandy	FINIDA		15.900
6	Consolidation of Bokkuwela WSS	Kandy	FINIDA		8.000
7	Consolidation of Alawathugoda WSS	Kandy	FINIDA		0.240
8	Consolidation of Ankumbura WSS	Kandy	FINIDA		1.450
9	Consolidation of Galhinna WSS	Kandy	FINIDA		3.000
10	Tennakumbura WSS	Kandy	FINIDA		1.500
11	Madamahannuwara WSS	Kandy	FINIDA		0.750
12	Wellamboda WSS	Kandy	FINIDA		1.500

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

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INTEGRATED RURAL DEVELOPMENT PROGRAMME

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ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.m)
1	Matugama water supply project	Kalutara		30000	6.400
2	Walallawita AGA Div 18 Dug Well Project	Kalutara			0.340
3	Agalawatta AGA Div. 37 Dug wells Project	Kalutara			0.700
4	Waterloo Gravity Scheme	Kalutara		270	0.140
5	Kadampitiya Water Supply for The School	Kalutara			0.030
6	Construction of Toilets (11,000 Nos)	Kalutara			16.500
7	Moneragala Town Water Supply Scheme	Monaragala	NORAD	22000	27.000
8	Thanamalwila Town Water Supply Scheme	Monaragala	NORAD	12000	14.000
9	Beliatta Water Supply Scheme	Hambantota	NORAD		2.000
10	Kudawella Water Supply Scheme	Hambantota	NORAD		1.980
11	Watamulla Water Supply Scheme	Hambantota	NORAD		10.000
12	Middeniya Town augmentation	Hambantota	NORAD	7800	11.500
13	Madulla & Madagama AGA Div. WSS Projects	Hambantota			5.700
14	Badalkumbura AGA Div. WS Projects	Hambantota			3.100

ON GOING WATER SUPPLY & SANITATION PROJECTS.

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MISCELLANEOUS.

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ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.m)
1	Koggala Water Supply Scheme for FTZ	Koggala	GCEC		15.000
2	Puttalam 35 Tube Wells	Puttalam	UNICEF		24.000
3	Mahaweli System B 27 Tube Wells	Maduru Oya	UNICEF		18.000
4	Mahaweli System H 12 Tube Wells	Kalawewa	UNICEF		0.800
5	Udawalawe 50 Tube Wells	Udawalawe	ADB/MECA		3.500

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

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VILLAGE PARTICIPAN PLANING PROCESS.

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ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.m)
1	Harammala Shallow Well Scheme	Kurunegala	CIDA/NWSDB		
2	Alawwa Shallow Well Scheme	Kurunegala	CIDA/NWSDB		
3	Werrambugedara Shallow & Tube Well Sche	Kurunegala	CIDA/NWSDB		
4	Kurunegala Shallow Well Scheme	Kurunegala	CIDA/NWSDB		
5	Maho Shallow & Tube Well Scheme	Kurunegala	CIDA/NWSDB		
6	Kuliyapitiya West Shallow Well Scheme	Kurunegala	CIDA/NWSDB		
7	Kotawehera Shellow Well Scheme	Kurunegala	CIDA/NWSDB		
8	Galgamuwa Shallow & Tube Well scheme	Kurunegala	CIDA/NWSDB		
9	Ridiyagama Gravity scheme	Kurunegala	CIDA/NWSDB		
10	Pannala	Kurunegala	CIDA/NWSDB		
11	Galgamuwa	Kurunegala	CIDA/NWSDB		
12	Polgahawela pipe scheme	Kurunegala	CIDA/NWSDB		
13	Jayabima	Kurunegala	CIDA/NWSDB		
14	Kurundankolama Tube & Shallow Well Project	Kurunegala	CIDA/NWSDB	60	
15	Ottukulama Shallow Well Project	Kurunegala	CIDA/NWSDB	75	
16	Ipolagama Tube & Shallow Well Project	Kurunegala	CIDA/NWSDB	46	
17	Madagalle Shallow Well Project	Kurunegala	CIDA/NWSDB	60	
18	Annukkana Shallow Well Project	Kurunegala	CIDA/NWSDB	32	
19	Hamunapotha Shallow Well Project	Kurunegala	CIDA/NWSDB	17	
20	Hapitiyawela shallow well project	Kurunegala	CIDA/NWSDB	66	
21	Kumbukkotuwa pumping scheme	Kurunegala	CIDA/NWSDB	30	
22	Sandagala shallow Sandagala shallow well project	Kurunegala	CIDA/NWSDB	132	
23	Acharigama shallow well	Kurunegala	CIDA/NWSDB	19	
24	Galatharaya Tube & shallow well project	Kurunegala	CIDA/NWSDB	78	
25	Ahasgoda Tube & shallow project	Kurunegala	CIDA/NWSDB	44	
26	Bandawa	Kurunegala	CIDA/NWSDB		
27	Katambula Pumping scheme & Well Project	Kurunegala	CIDA/NWSDB	90	
28	Udahena Gravity Scheme	Kurunegala	CIDA/NWSDB	93	
29	Hiriketiya shallow well project	Kurunegala	CIDA/NWSDB	8	
30	Arunadagama	Kurunegala	CIDA/NWSDB	50	
31	Tambagalla Pumping Scheme	Puttalam	CIDA/NWSDB		
32	Ambakandawila Pumping scheme	Puttalam	CIDA/NWSDB		
33	Kahatawila tube well scheme	Puttalam	CIDA/NWSDB		
34	Nankadawala well project	Puttalam	CIDA/NWSDB		
35	Tammannawetiya wells project	Puttalam	CIDA/NWSDB		
36	Marawila well scheme	Puttalam	CIDA/NWSDB		
37	Serukela pumping scheme	Puttalam	CIDA/NWSDB		
38	Mudalipali pumping scheme	Puttalam	CIDA/NWSDB		
39	Surukkulama pumping scheme	Puttalam	CIDA/NWSDB		
40	Managalapura pumping upgrading	Puttalam	CIDA/NWSDB	211	
41	Madulappali pumping & Shallow well scheme	Puttalam	CIDA/NWSDB	145	
42	Rambukangama Tube & shallow well project	Puttalam	CIDA/NWSDB	158	
43	Thammenwawetiya shallow & Tube well project	Puttalam	CIDA/NWSDB	145	
44	Pulichchkulam pumping scheme	Puttalam	CIDA/NWSDB	190	
45	Kandan	Puttalam	CIDA/NWSDB	119	
46	Surakkalam shallow & tube well project	Puttalam	CIDA/NWSDB	155	

47	Thahewa pumping & shallow well project	Puttalam	CIDA/NWSDB	121	
48	Wairankattuwa tube & shallow well project	Puttalam	CIDA/NWSDB	158	
49	Serukele colony shallow well project	Puttalam	CIDA/NWSDB	125	
50	Wijayakulupitha Tube & shallow well project	Puttalam	CIDA/NWSDB	400	
51	Ambakandawila shallow well project	Puttalam	CIDA/NWSDB	329	
52	Merawala pumping scheme	Puttalam	CIDA/NWSDB	120	
53	Nanladawata shallow well project	Puttalam	CIDA/NWSDB	293	
54	Thambagalla shallow well project	Puttalam	CIDA/NWSDB	148	
55	Sindathriyn pumping scheme	Puttalam	CIDA/NWSDB	120	
56	Kanahentota Tube & shallow well project	Galle	CIDA/NWSDB	103	
57	Nagahatennawatta Tube & shallow well project	Galle	CIDA/NWSDB	45	
58	Imbulapitiya gravity scheme	Galle	CIDA/NWSDB	42	
59	Mathtaka Gravity scheme	Galle	CIDA/NWSDB	217	
60	Halgaswatura colony gravity scheme	Galle	CIDA/NWSDB	90	
61	Mandalapura gravity scheme	Galle	CIDA/NWSDB	60	
62	Kirinuga shallow well scheme	Galle	CIDA/NWSDB	138	
63	Pahathaweliwitaya gravity scheme	Galle	CIDA/NWSDB	142	
64	Kossetahena shallow well scheme	Galle	CIDA/NWSDB	242	
65	Nawagammana colony shallow well scheme	Galle	CIDA/NWSDB	100	
66	Akurala pump extention project	Galle	CIDA/NWSDB	359	
67	Ellagoda shallow well project	Galle	CIDA/NWSDB	42	
68	Halpathota pump extention project	Galle	CIDA/NWSDB	116	
69	Kukulalawatta pump extention project	Galle	CIDA/NWSDB	67	
70	Welipitamodara	Galle	CIDA/NWSDB	446	
71	Damduwanna shallow well project	Galle	CIDA/NWSDB	120	
72	Elukliya pumping scheme	Galle	CIDA/NWSDB	161	
73	Mapitigama gravity scheme	Galle	CIDA/NWSDB	61	

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

Mahaweli Engineering Construction Agency.

ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.(m))	
1	Senapura Area Centre	System B	E.E.C.	430	12.000	Floating Population – School 1500, OPD 250
2	SewanapituyaArea Centre	System B	E.E.C.	430	12.000	
3	Welikanda Township	System B	E.E.C.	2000	27.000	
4	Aranaganwila Township	System B	G.O.S.L.	2000	12.000	
5	Dimbulagala Area Centre	System B	G.O.S.L.	430	12.000	
6	Damminna Area Centre	System B	G.O.S.L.	430	12.000	
7	Allawewa AreaCentre	System B	G.O.S.L.	430	12.000	
8	Manampitiya Township	System B	G.O.S.L.	430	12.000	
9	Seware Disposal Scheme-Welikanda Townsh	System B	E.E.C.		5.93	
10	Sirapira Water Supply Scheme	System C	Kuwait	430	12.000	
11	Medagama Water Supply Scheme	System C	Kuwait	430	12.000	
12	Lihiniyaga Water Supply Scheme	System C	Kuwait	430	12.000	
13	Sandunpura Water Supply Scheme	System C	Kuwait	430	12.000	
14	Batalaya Water Supply Scheme	System C	M.E.C.A.	430	12.000	
15	Nawaragala Water Supply Scheme	System C	Kuwait	430	12.000	
16		System C	Kuwait	430	12.000	
17	Vehenagala Water Supply Scheme	System C	Kuwait	430	12.000	
18	Girandurukotte Rehabilitation Project	System C				
	Dehiattakandiya Water Supply Scheme	System C	W.B.	2000	57.000	

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

SARVODAYA (Rural Sector)

ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.(m))
1	Construction of Wells – Mailtewa	A'Pura		380	0.045
2	Construction of Wells – Bandaragama	A'Pura		370	0.060
3	Construction of Wells – Ihalapuliyankulama	A'Pura		460	0.015
4	Construction of Wells – Manewa	A'Pura		560	0.033
5	Constr. of Wells & Latrines–Rajanganaya	A'Pura		1400	0.016
6	Construction of Wells – Walawegama	A'Pura		460	0.001
7	Construction of Wells – Hettikattiya	A'Pura		442	0.045
8	Construction of Wells – Lahonoruwa	A'Pura		576	0.045
9	Construction of Wells – Katugampa[illegible]ama	A'Pura		270	0.075
10	Construction of Wells & Latrines–Moragoda	A'Pura		350	0.070
11	Construction of Wells – Kanjanamkulama	A'Pura		250	0.100
12	Village Water Supply – Kalugahakandura	Badulla		400	0.080
[illegible]	[illegible]uction of Wells – Thatilla	Badulla		450	0.050
[illegible]	[illegible] Water Supply – Oruwelagaha	Badulla		600	0.005
14	Village Water Supply – Oruwelagaha	Badulla		270	0.080
15	Construction of Wells – Ikiriyanpolelanda	Badulla		700	0.125
16	Village Water Supply – Yompanagama	Badulla		300	0.070
17	Village Water Supply – Gurulupotha	Badulla		750	0.150
18	Village Water Supply – Dikkapitiya	Badulla		360	0.080
19	Construction of Wells – Tennegalalanda	Badulla		550	0.110
20	Village Water Supply – Arawakumbura	Badulla		375	0.003
21	Constr. of Wells & Latrines–Shanthalokagama	Colombo		400	0.015
22	Constr. of Wells & Latrines – Watteqedara	Colombo		250	0.020
23	Constr. of Wells & Latrines – Hewagama	Colombo		275	0.016
24	Constr. of Wells & Latrines – Gothatuwa	Colombo		280	0.125
25	Construction of Wells – Godigamuwa	Colombo		150	0.045
26	Construction of Wells – Dehiwala	Colombo		215	0.275
27	Construction of Wells – Jayawadanawatta	Colombo			

• Work Plan 1992 1993

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

SARVODAYA (Rural Sector)

ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.(m))
28	Constr. of Wells & Latrines – Malawenne	Galle		125	0.021
29	Constr. of Wells & Latrines – Meegaspitiya	Galle		165	0.025
30	Village Water Supply – Dammala Janpadaya	Galle		1350	0.250
31	Construction of Wells – Ith[illegible]ana	Galle		660	0.075
32	W.S. & Constr. of Latrines – Medagama	Galle		1450	0.250
33	W.S. & Constr. of Latrines – Udugalakanda	Galle		1600	0.075
34	Constr. of Wells & Latrines – Webada	Gam[illegible]tha		200	0.045
35	Constr. of Wells & Latrines – Mahawalawatta	Ga[illegible]		250	0.045
36	Construction of Wells – Kepungoda	Gam[illegible]na		300	0.030
37	Village Water Supply – Hissela	Gampaha		1000	0.125
38	Construction of Wells – Giriulla	Kandy		250	0.110
39	W.S. & Constr. of Wells – Kobbewela	Kandy		250	0.105
40	Village Water Supply – Kalugalhinna	Kandy		425	0.175
41	Construction of Wells – Makkanigama	Kandy		325	0.085
42	Village Water Supply – Nehinawala	Kandy		500	0.210
43	Construction of Wells – Wegala	Kandy		425	0.060
44	Village Water Supply – Uda-wela	Kandy		500	0.090
45	Construction of Wells – Ududeniya	Kandy		750	0.045
46	Village Water Supply – Galabalana Kanda	Kegalle		1000	0.280
47	Village Water Supply – Malgammana	Kegalle		600	0.175
48	Village Water Supply – Debathgama	Kegalle		1100	0.120
49	Village Water Supply – Lihiniyagala	Kegalle		190	0.200
50	Village Water Supply – Basnagala	Kegalle		325	0.150
51	Construction of Wells – Dodanthalayaya	Kegalle		746	0.050
52	Construction of Wells – Malandeniya	Kurunegala		1168	0.070
53	Construction of Wells – Dahanakgama	Kurunegala		480	0.080
54	Construction of Wells – Manewa	Kurunegala		478	0.039

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

SARVODAYA (Rural Sector)

ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.(m))
55	Construction of Wells – Henyay	Kurunegala		275	0.045
56	Construction of Wells – Akarawatta	Kurunegala		295	0.065
57	Village Water Supply – Galataraya	Kurunegala		15	0.060
58	Construction of Wells – Kohanegama	Kurunegala		310	0.125
59	Construction of Wells – Witikuliya	Kurunegala		233	0.055
60	Construction of Wells – Nitlandwatta	Kurunegala		185	0.075
61	Construction of Wells – Talamalagama	Kurunegala		600	0.120
62	Construction of Wells – Ibulana	Kurunegala		450	0.117
63	Construction of Wells – Gamankada	Kurunegala		474	0.070
64	Construction of Wells – Galpotuyaya	Kurunegala		550	0.098
65	Construction of Wells – Opalgala	Matale		500	0.027
66	Construction of Wells – Akurambada-North	Matale		450	0.099
67	Construction of Wells – Udawehigala	Matale		500	0.045
68	Construction of Wells – Kandenuwara	Matale		450	0.018
69	Construction of Wells – Thalakiriyagama	Matale		600	0.060
70	Construction of Wells – Weththiyaya	Matale		250	0.050
71	Village Water Supply – Ovitikanda	Matale		700	0.100
72	Construction of Wells – Ambanpola	Matale		500	0.070
73	Village Water Supply – Ihala Matale Watta	Matale		1000	0.203
74	Construction of Wells – Sapugas Ara	Matara		800	0.042
75	Construction of Wells – Noodugamuwa	Matara		405	0.016
76	Const. of Wells & Latrines – Galagama	Matara		1374	0.019
77	Village Water Supply – Darangala	Matara		200	0.020
78	Village Water Supply – Gomola I	Matara		295	0.010
79	Village Water Supply – Gomola II	Matara		890	0.350
80	Village Water Supply – Didenipotha	Matara		300	0.150
81	Const. of Wells & Latrines – Diyagaha West	Matara		162	0.050

* Work Plan 1992 – 1993

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

SARVODAYA (Rural Sector)

ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.(m))	
82	Construction of Wells – Kurunduwatta	Matara		120	0.060	
83	Construction of Wells – Udawa	Matara		600	0.055	
84	Const. of Wells & Latrines – Kumbuk Ara	Matara		305	0.070	
85	Construction of Wells – Udupeelegoda	Matara		600	0.065	
86	Village Water Supply – Theripaha	N'Eliya		600	0.020	
87	Village Water Supply – Ambatalawa	N'Eliya		600	0.297	
88	Village Water Supply – Kalaganawatta	N'Eliya		360	0.100	
89	Village Water Supply – Panangammana	N'Eliya		450	0.125	
90	Village Water Supply – Matyaddagama	N'Eliya		600	0.075	
91	Village Water Supply – Waggama	N'Eliya		350	0.150	
92	Village Water Supply – Ekiriya-Medagama	N'Eliya		650	0.100	
93	Village Water Supply – Glentilt	N'Eliya		625	0.080	
94	Village Water Supply – Perakimpura	N'Eliya		520	0.090	
95	Village Water Supply – Argail	N'Eliya		300	0.042	
96	Village Water Supply – Methagama	N'Eliya		600	0.080	
97	Village Water Supply – Borahinna	N'Eliya		400	0.050	
98	Construction of Wells – Akkara 600	Polonnaruwa		125	0.036	
99	Construction of Wells – Medagampura	Polonnaruwa		38	0.060	
100	Construction of Wells – Diyasenapura	Polonnaruwa		65	0.095	
101	Construction of Wells – Karavitagara	Puttalam		40	0.003	
102	Constr. of Wells & Latrines – Yakdessawa	Puttalam		50	0.012	
103	Con. of Wells & Latrines – Mugunuwatawana	Puttalam		140	0.010	
104	Construction of Wells – Athuwana	Puttalam		50	0.080	
105	Constr. of Wells & Latrines – Willaththawa	Puttalam		60	0.075	
106	Constr. of Wells & Latrines – Karukkuwa	Puttalam		600	0.085	
107	Constr. of Wells & Latrines – Macurankuliya	Puttalam		100	0.085	
108	Construction of Wells – Samidugama	Puttalam		40	0.075	

ON-GOING WATER SUPPLY & SANITATION PROJECTS.

SARVODAYA (Rural Sector)

ITEM	DESCRIPTION	PLACE	FUNDED BY	POPULATION SURVED	ESTIMATED COST (Rs.(m))	
109	Constr. of Wells & Latrines – HIA Village	Puttalam		80	0.085	
110	Construction of Wells – Paaliyagama	Puttalam		40	0.085	
111	Construction of Wells – Mugunuwatawana	Puttalam		70	0.090	
112	Constr. of Wells & Latrines – Merungoda	Puttalam		100	0.070	
113	Construction of Wells – Koswatta	Puttalam		300	0.065	
114	Construction of Wells – Mudukatuwa	Puttalam		100	0.055	
115	Constr. of Wells & Latrines – Rajakadaluwa	Puttalam		90	0.075	
116	Construction of Wells – Medabedda	Ratnapura		650	0.015	
117	Village Water Supply – Kalatuwana-West	Ratnapura		500	0.020	
118	Construction of Wells – Gemunugama	Ratnapura		800	0.032	
119	Construction of Wells – Hatangala	Ratnapura		150	0.090	
120	Village Water Supply – Seelagama	Ratnapura		400	0.200	
121	Village Water Supply – Eknaligoda	Ratnapura		310	0.100	
122	Constr. of Wells & Latrines – Madampe	Ratnapura		200	0.090	
123	Constr. of Wells & Latrines – Eraporuwa	Ratnapura		240	0.090	
124	Constr. of Wells & Latrines – Deiyyangala	Ratnapura		210	0.090	
125	Constr. of Wells & Latrines – Nugagalayaya	Ratnapura		400	0.073	

APPENDIX - 4

EXISTING NWSDB WATER SUPPLY SCHEMES AS AT END 1988

NAME OF SCHEME	DISTRICT	ELECTORATE	POPULATION SERVED	PRODUCTION (Cum/d)
AMPARAI	AMPARAI	AMPARAI	17000	3569
INGINIYAGALA	AMPARAI	AMPARAI	2800	340
KALMUNAI	AMPARAI	KALMUNAI	5000	42
MAHA OYA	AMPARAI	AMPARAI	500	20
NAVITHANVELI	AMPARAI	AMPARAI	3300	0
UHANA (NEW)	AMPARAI	AMPARAI	2000	1735
UHANA (OLD)	AMPARAI	AMPARAI	3000	61
UNIT 2F (UHANA)	AMPARAI	AMPARAI	2000	558
ANURADHAPURA	ANURADHAPURA	ANURADHAPURA EAST	36000	6219
ANURADHAPURA SACRED AREA	ANURADHAPURA	ANURADHAPURA WEST	5000	333
EPPAWALA	ANURADHAPURA	KEKIRAWA	1000	0
HABARANA	ANURADHAPURA	KEKIRAWA	500	22
HOROWPATHANA	ANURADHAPURA	HOROWPATHANA	1000	33
KAHATAGASDIGILIYA	ANURADHAPURA	HOROWPATHANA	3000	191
KEBITIGOLLEWA	ANURADHAPURA	MEDAWACHCHIYA	2400	172
KEKIRAWA	ANURADHAPURA	KEKIRAWA	4100	458
MEDAWACHCHIYA	ANURADHAPURA	MEDAWACHCHIYA	2100	201
MARADANKADAWALA	ANURADHAPURA	MIHINTALE	1200	41
MIHINTALE	ANURADHAPURA	MIHINTALE	5000	12
PANDULAGAMA	ANURADHAPURA	ANURADHAPURA WEST		
VIJAYAPURA	ANURADHAPURA	ANURADHAPURA WEST	3600	180
RATMATAWATTE HOUSING	BADULLA	BADULLA		
ATALAPITIYA-DIYABIBILA	BADULLA	BANDARAWELA	3050	52
BADULUSIRIGAMA	BADULLA	BADULLA	1000	47
BADULLA	BADULLA	BADULLA	30700	6269
BANDARAWELA	BADULLA	BANDARAWELA	4900	1023
BORALANDA	BADULLA	WELIMADA	4000	252
DIGANATENNA	BADULLA	BANDARAWELA	2000	135
DIVITOTAWELA	BADULLA	WELIMADA	3800	330
DIYATALAWA	BADULLA	HAPUTALE	7300	1110
HALDUMMULLA	BADULLA	HAPUTALE	2500	217
HALIELA	BADULLA	HALIELA	2500	308
HIVALKANDURA	BADULLA	HAPUTALE	1000	106
JINANANDAGAMA	BADULLA	BADULLA	1000	40
KANDEKETIYA	BADULLA	WIYALUWA	1000	44
KEPPETIPOLA	BADULLA	WELIMADA	8000	1125
KOLATENNA	BADULLA	BANDARAWELA	1500	50
LIYANGAHAWELA	BADULLA	BANDARAWELA	2600	89
MAHAKELE	BADULLA	WIYALUWA	200	45
MAHIYANGANA	BADULLA	MAHIYANGANA	5100	889
MEDAWALA	BADULLA	UVA-PARANAGAMA	2000	220
UDENIGAMA	BADULLA	HALIELA	500	
NELUMGAMA	BADULLA	BADULLA	500	47
PERALANDA	BADULLA	HALIELA	1000	
SAMUDUGAMA	BADULLA	PASSARA	650	55
SAREWATTE(DIMUTHUGAMA)	BADULLA	WELIMADA	2600	275
SEELATENNA	BADULLA	HAPUTALE	2000	216
SILMIYAPURA	BADULLA	WELIMADA	1000	90
SIRIMALGODA	BADULLA	BADULLA	800	45
SORAGUNE(AMILAGAMA)	BADULLA	HAPUTALE	1300	69

VIHARAKELI-UMANKANDURA	BADULLA	HAPUTALE	500	7
WASANAGAMA	BADULLA	WIYALUWA	1200	130
WELIMADA	BADULLA	WELIMADA	3000	273
WEWAGAMA-RATNODAGAMA	BADULLA	UVA-PARANAGAMA	750	48
LUNUGALA	BADULLA	PASSARA	2600	270
BATTICALOA	BATTICALOA	BATTICALOA	30000	1000
KATTANKUDY	BATTICALOA	BATTICALOA	15000	217
KELLAR	BATTICALOA	PADDIRIPPU		
AVISSAWELLA	COLOMBO	AVISSAWELLA	14600	1435
GREATER COLOMBO SCHEME	COLOMBO	COLOMBO	372500	
BATTARAMULLA	COLOMBO	KOTTE	50000	
COLOMBO	COLOMBO	COLOMBO	685000	
DEHIWALA-MT.LAVINIA	COLOMBO	DEHIWALA	188000	
KOLONNAWA	COLOMBO	KOLONNAWA	40000	
KOTIKAWATTE	COLOMBO	KOLONNAWA	8000	
KOTTE	COLOMBO	KOTTE	113000	
MATTEGODA HOUSING	COLOMBO	HOMAGAMA	8400	
MORATUWA	COLOMBO	MORATUWA	116000	
MULLERIYAWA	COLOMBO	KOLONNAWA	20000	
RUKMALE HOUSING	COLOMBO	MAHARAGAMA	3000	
PILIYANDALA	COLOMBO	KESBEWA	2500	107
AMBALANGODA-BALAPITIYA	GALLE		15600	1047
BADDEGAMA TOWN	GALLE	BADDEGAMA	2000	132
GALLE-WACKWELLA	GALLE	GALLE	100500	14547
HABARADUWA	GALLE	HABARADUWA	3000	88
HIKKADUWA-DODANDUWA	GALLE	RATGAMA	36500	870
PITIGALA	GALLE	HINIDUMA	3000	286
BATALEEYA.	GAMPAHA	MIRIGAMA	1000	113
BIYAGAMA IPZ	GAMPAHA	BIYAGAMA		
GAMPAHA	GAMPAHA	GAMPAHA	7000	1881
GREATER COLOMBO (NORTH)	GAMPAHA			
KELANIYA	GAMPAHA	KELANIYA	30000	
MABOLE	GAMPAHA	JA ELA	20500	
PELIYAGODA	GAMPAHA	WATTALA	25000	
RAGAMA	GAMPAHA	JA ELA	20000	
DALUGAMA	GAMPAHA	KALANIYA		
KANDANA	GAMPAHA	JA ELA		
WATTALA	GAMPAHA	WATTALA	15000	
WELISARA	GAMPAHA	JA ELA	25000	
KATUNAYAKE IPZ	GAMPAHA	KATUNA	10000	2220
KELANIYA TEMPLA	GAMPAHA	BIYAGAMA	1000	256
MALWANA	GAMPAHA	BIYAGAMA	5000	286
NEGOMBO	GAMPAHA	NEGOMBO	96000	14096
PUGODA	GAMPAHA	DOMPE	3300	57
RADDOLUWA HOUSING	GAMPAHA	KATANA	11000	1484
RAGAMA HOSPITAL	GAMPAHA	JA ELA	1000	301
RANPOKUNAWATTE	GAMPAHA	DOMPE	2700	973
AMBALANTOTA-HAMBANTOTA	HAMBANTOTA	TISSAMAHARAMA	9000	4520
BELIATTA	HAMBANTOTA	BELIATTE	5000	1090
HUNGAMA	HAMBANTOTA	TANGALLE	11600	378
KIRAMA	HAMBANTOTA	MULKIRIGALA	1500	85
KIRINDA YODAKANDIYA	HAMBANTOTA	TISSAMAHARAMA	5000	126
KADUWELA	HAMBANTOTA	BELIATTE	1000	20
PANNAGAMUWA	HAMBANTOTA	TISSAMAHARAMA	1000	16
RANNA	HAMBANTOTA	TANGALLE	11100	928
RIDIYAGAMA	HAMBANTOTA	TISSAMAHARAMA	2000	340
TALUNNA	HAMBANTOTA	TISSAMAHARAMA	1000	7
TANGALLE	HAMBANTOTA	TANGALLE	9900	2055

TISSAMAHARAMA DEBARAWEWA	HAMBANTOTA	TISSAMAHARAMA	4900	968
UNAKURUWA	HAMBANTOTA	TANGALLE	1000	18
WALASMULLA	HAMBANTOTA	MULKIRIGALA	1900	43
MIDDENIYA	HAMBANTOTA	MULKIRIGALA	2500	
ARALATIVU	JAFFNA	KAYTS	2000	0
ARALY SOUTH	JAFFNA	VADDUKKODAI	3700	36
CHUNNAKAM	JAFFNA	MAINPAY	3000	0
KALLADY	JAFFNA	KANKASANTHURAI	600	3
KENKESANTHURAI	JAFFNA	KANKESANTURAI	14000	0
KANPOLAI RAJAKRAMAM	JAFFNA	UDDUPIDDY	3500	12
KARAVEDDY	JAFFNA	UDDUPIDDY	4000	94
KAYTS	JAFFNA	KAYTS	4000	26
NAINATHIVU	JAFFNA	KAYTS	2200	19
PT PEDRO/CHAVAKACHCHERI	JAFFNA	CHAVAKACHCHERI	30000	0
VADDUKODDAI	JAFFNA	VADDUKKODAI	3000	23
VELANAI	JAFFNA	KAYTS	3700	28
VELVETITURAI	JAFFNA	UDUPIDDY	5700	17
WATHARAWATTAI	JAFFNA	VADDUKKODAI	1800	24
HORANA	KALUTARA	HORANA	9200	654
KALUTARA & SOUTH AREA	KALUTARA	KALUTARA	3500	
ALUTHGAMA	KALUTARA		6500	
BERUWELA	KALUTARA	BERUWALA	25200	
BENTOTA	KALUTARA			
DHARGA TOWN	KALUTARA		10000	
PAYAGALA	KALUTARA			
WADDUWA	KALUTARA		15000	
PANADURA	KALUTARA	PANADURA	57000	6904
AKURANA	KANDY	HARISPATTUWA	12200	214
AMPITIYA-TENNEKUMBURA	KANDY	SENKADAGALA	20500	214
BOKKAWELA	KANDY	HARISPATTUWA	5300	
GALAGEDARA	KANDY	GALAGEDARA	4400	532
GALHINNA	KANDY	HARISPATTUWA	3360	
GOHAGODA	KANDY	HARISPATTUWA	6540	
HALOLUWA	KANDY	HARISPATTUWA	1820	
HANTANA	KANDY	UDUNUWARA	2000	160
HEDENIYA	KANDY	HARISPATTUWA	2500	
HUNNAN OYA	KANDY	HARISPATTUWA	4500	
KADUGANNAWA	KANDY	YATINUWARA	1500	659
KONDADENIYA	KANDY	HARISPATTUWA	3960	
MARIAWATTE	KANDY	GAMPOLA	4000	63
MINIGAMUWA	KANDY	GALAGEDARA	1000	42
NEW TELDENIYA	KANDY	TELDENIYA	15000	
NIKATENNA	KANDY			
PERADENIYA UNIVERSITY	KANDY	UDUNUWARA	10000	4115
POLGOLLA	KANDY	PATHA DUMBARA	800	455
RAMBUKPITIYA	KANDY		2000	
UDUNUWARA YATINUWARA	KANDY	YATINUWARA	37700	2232
YATIHALAGALA	KANDY	HARISPATTUWA		
ALAWATUGODA	KANDY	HARISPATTUWA	8440	
ANKUMBURA	KANDY	HARISPATTUWA	2100	
ATHGALA	KANDY	NAWALAPITIYA		
BALANAGAMA/POLGOLLA	KANDY	PATHADUMBARA	1500	
GALAHA	KANDY	UDUNUWARA	2500	
KALLUGAMMANA	KANDY		6630	
PAHALAKADUGANAWA	KANDY	YATINUWARA	1000	32
KEGALLE	KEGALLE	ARANAYAKE	5000	337
DEHIOWITA	KEGALLE	RUWANWELLA	2300	204
GONAGALDENIYA	KEGALLE	RUWANWELLA	1200	42

KANNANTOTA	KEGALLE	RUWANWELLA	4200	150
KEGALLE	KEGALLE	KEGALLE	15300	3482
MAWANELLA	KEGALLE	MAWANELLA	9600	1322
RAMBUKKANA	KEGALLE	RAMBUKKANA	6500	442
RUWANWELLA	KEGALLE	RUWANWELLA	4600	477
YATIYANTOTA	KEGALLE	YATIYANTOTA	1900	425
KILINOCHCHI	KILINOCHCHI		8000	0
ALAWWA	KURUNEGALA	DAMBADENIYA	3000	110
AMBANPOLA	KURUNEGALA	YAPAHUWA	2100	37
BULUWELA	KURUNEGALA	DODANGASLANDE	1000	10
GALGAMUWA	KURUNEGALA	GALGAMUWA	4000	235
GIRIULLA	KURUNEGALA	KATUGAMPALA	1800	116
GOKARELLA	KURUNEGALA	HIRIYALA	1400	130
HETTIPOLA	KURUNEGALA	PANDUWASNUWARA	3000	198
NIKEWERATIYA	KURUNEGALA	NIKAWERATIYA	6600	150
OGEDAPOLA	KURUNEGALA	DODANGASLANDA	8000	132
PADENIYA	KURUNEGALA	YAPAHUWA	300	8
PANNALA	KURUNEGALA	KATUGAMPOLA	5000	59
POLGAHAWELA	KURUNEGALA	POLGAHAWELA	3300	965
RANBODAGALLE	KURUNEGALA	DODANGASLANDA	2000	159
UDAGAME	KURUNEGALA	YAPAHUWA	300	9
WANNIGAMA	KURUNEGALA	NIKAWERATIYA	500	35
WARIYAPOLA	KURUNEGALA	WARIYAPOLA	5000	166
DODANGASLANDA	KURUNEGALA	DODANGASLANDA		
EGODAPOLA	KURUNEGALA		5000	
KURUNEGALA	KURUNEGALE	KURUNEGALE	9600	2462
ERUKKULAMPIDDY	MANNAR	MANNAR	440014	148
MANNAR	MANNAR	MANNAR	15000	716
TALAIMANNAR	MANNAR	MANNAR	1000	55
THEVANPIDDY	MANNAR	MANNAR	600	5
THIRUKATHESWARAN	MANNAR	MANNAR	1600	16
VANKALAI	MANNAR	MANNAR	3500	31
VIDATHALTIVU	MANNAR	MANNAR	4000	21
DAMBULLA	MATALE	DAMBULLA	3400	245
MATALE	MATALE	MATALE	31100	1354
NAULA	MATALE	LAGGALA	1900	119
UKUWELA-UDATENNA	MATALE	RATTOTA		
UKUWELA	MATALE	RATTOTA	3000	338
PUSSELLA/HUNUKETE	MATALE	RATTOTA	3500	300
MATARA COMBINED SCHEME	MATARA	DEVINUWARA	115800	11150
DEVINUWARA DONDRA	MATARA	DEVINUWARA		
DICKWELLA	MATARA	MATARA		
GANDARA	MATARA	MATARA		
KOTTEGODA	MATARA	MATARA		
UYANWATTE	MATARA	MATARA		
NADUGALA	MATARA	MATARA		
URUBOKKA	MATARA	HAKMANA	5000	37
WELIGAMA	MATARA	WELIGAMA	11000	1102
KATUWANA	MATARA	MULKIRIGALA		
WEERAWILA	MATARA	TISSAMAHARAMA		
DENIYAYA	MATARA	DENIYAYA	4700	180
WELLAWAYA	MONARAGALA	WELLAWAYA	5000	121
THANEMANWILA	MONERAGALA	WELLAWAYA	2000	150
KATARAGAMA	MONERAGALA	WELLAWAYA	2500	1870
MAYARAGAMA	MONERAGALA	MONARAGALA	300	3
MASKELIYA	NUWARAELIYA	NELIYA-MASKELIYA	5000	52
MULLEPIHILA	NUWARAELIYA		1000	52
NALLATHANNI	NUWARAELIYA	NELIYA-MASKELIYA	700	22

SRI PADA	NUWARAELIYA	NELIYA-MASKELIYA	1000	38
WIJEBAHUKANDA	NUWARAELIYA	KOTMALE	2000	
POLONNARUWA	POLONNARUWA	POLONNARUWA	12000	604
DIMBULAGALA	POLONNARUWA	POLONNARUWA	250	22
WIJITHAPURA	POLONNARUWA	POLONNARUWA		
HINGURAKGODA	POLONNARUWA	MINNERIYA	9000	1
ANAMADUWA	PUTTALAM	ANAMADUWA	1500	56
ANDIGAMA	PUTTALAM	ANAMADUWA	2000	30
BANGADENIYA	PUTTALAM	CHILAW	1000	82
DANKOTUWA	PUTTALAM	WENNAPPUWA	3800	183
NATTANDIYA	PUTTALAM	NATTANDIYA	3500	101
SAMURDIGAMA	PUTTALAM	ANAMADUWA	800	14
WENNAPUWA	PUTTALAM	WENNAPPUWA	6500	161
BALANGODA	RATNAPURA	BALANGODA	9400	1309
EHELIYAGODA	RATNAPURA	EHELIYAGODA	6000	314
EMBILIPITIYA	RATNAPURA	KOLONNA	2000	3177
MAHAWATTE	RATNAPURA	PALMADULLA	6000	364
NIVITIGALA (NEW)	RATNAPURA	NIVITIGALA	2500	151
PELMADULLA	RATNAPURA	PALMADULLA	6150	451
RATNAPURA	RATNAPURA	RATNAPURA	18300	4329
RATNAPURA (NEW TOWN)	RATNAPURA	RATNAPURA	2000	
PAMBEHINNA/MUTTETU	RATNAPURA		1500	50
WIJERIA	RATNAPURA	KOLONNA	4000	
UDAWALAWE	RATNAPURA	KOLONNA	5000	2000
HARBOUR VILLAGE	TRICOMALEE	TRINCOMALEE	1750	32
KANTALAI	TRINCOMALEE	SERUWILA	5900	227
PALIUTTU	TRINCOMALEE	TRINCOMALEE	2900	329
SAMPUR	TRINCOMALEE	SERUWILA	1500	9
SERUWILA	TRINCOMALEE	SERUWILA	6300	99
TRINCOMALEE	TRINCOMALEE	TRINCOMALEE	40000	789
ALIOLUWA	TRINCOMALEE	SERUWILA	2500	204
NADUNKENI	VAVUNIA		1100	73
VAVUNIA	VAVUNIA	VAVUNIA	18000	208

after 1988 to end 1990

NAME OF SCHEME	DISTRICT	ELOCTORATE	POPULATION SERVED	PRODUCTION (CUM/D).
1. Aniyakanda	Gampaha	Jaela		
2. Jawatte	Gampaha	Ekala		
3. Talapolla	Gampaha	Jaela		
4. Mahiyangana	Badulla	Mahiyangana		
5. AranKale	Bandarawela	Bandarawela		
6. Dodangaslanda	Kurunegala	Dodangaslanda		
7. Polgolla	Kandy	~~Polgolla~~		
8. Pallekale	Kandy	Kundasale		
9. Lunuwatte	Nuwara Eliya	Lunuwatte		
10. Matale	Matale	Matale		
11. K.K.S. Jaffna	Jaffna	Jaffna		
12. Piyagama	~~Balapitiya~~ Sama	Balapitiya		
13. Padukka	Colombo	Padukka		
14. Panagoda	Colombo	Homagama		
15. Katuwana	Colombo	Homagama		
16. Hettipola	Kurunegala	Hettipola		
17. Chilaw	~~Chilaw~~ Puttalam	Chilaw		
18. Bandarakoswatte	Kurunegala	Kurunegala		
19. Amparai	Amparai	Amparai		
20. Kundasale	Kandy	Kundasale		
21. Mawella	Matara	Matara		
22. Kudawella	Matara	Matara		
23. Bundala	Matara	Matara		
24. Manna	Manna	Manna		
25. Mirigama	Gampaha	Gampaha		

Appendix 6

Cost to be incurred

Spring Intake	Rs. 8,074.66
Dug well covered 4 m dia x 10 m deep	Rs. 38,616.00
Dug well 2 m dia. x 10 m	Rs. 18,301.00
Dug well with infiltration pipe	Rs.108,663.00
Dug well with apron 1.5 m dia. x 10 m deep in Brick work	Rs. 27,643.00
Dug well with apron 1.5 m dia. x 4 m deep in Brick work	Rs. 13,248.45
Dug well with Hand pump 1.5 m dia. x 10 m deep in Brick work	Rs. 50,510.00
Dug well with Hand pump 1.5 m dia. 4 m deep	Rs. 24,154.00
Tube well complete with hand pump	Rs. 92,102.00
Improvements to roof for Rainwater	Rs. 4,200.00
Ferrocement tank 3500 litres	Rs. 7,056.00
Ferrocement tank 1500 litres	Rs. 4,448.00
Horizontal Roughing filter 6x2x2 m	Rs. 9,000.00

B.O.Q FOR PIPES AND FITTINGS
OF A TYPICAL RAINWATER SYSTEM FOR AN EXISTING ROOF
AS PER JANUARY 1991 RATES
No overheads and profits

Item	Description	Quantity	Rate SL.Rs	Amount SL.Rs
	PVC GUTTERS			
1	150 mm diameter PVC half round gutter rate to include fixing brackets at every 1 m intervals	12 M	180.00	1536.00
2	Fixing stop ends for the gutters	04 No	60.00	240.00
3	Fixing gutter boxes	02 No	265.00	530.00
	PVC DOWN PIPES & FITTINGS			
4	75 mm diameter PVC down pipes rate to include fixing brackets	10 M	118.00	1180.00
5	75 mm diameter PVC bends rate to include fixing	03 No	65.00	195.00
6	75 mm diameter PVC T joints rate to include fixing	02 No	235.00	470.00
7	75 mm diameter PVC removable end	01 No	50.00	50.00
	TOTAL			4201.00

B.O.Q FOR CONSTRUCTION OF 1500 LITRE FERROCEMENT RAIN WATER TANK AS PER JANUARY 1991 RATES
No overheads and profits

Item	Description	Quantity	Rate SL.Rs	Amount SL.Rs rounded
	EARTH WORKS			
1	Earth excavation in foundation	0.35M³	56.25	20.00
2	Earth filling in foundation and compacting in 200 mm thick layers	0.5M³	22.50	12.00
	R.R. MASONARY			
3	R.R. masonary in foundation with 1:5 cement motar	0.6M³	975.00	585.00
	FERROCEMENT			
4	40 mm thick ferrocement in walls rate to include 2 layers of 25 mm welded mesh placed in position as per detail	5.3M²	301.00	1595.00
5	40 mm thick ferrocement roof slab rate to include 2 layers of chicken mesh placed in position as per detail	1.4M²	301.00	425.00
6	CEMENT CONCRETE 1:2:4 (20 mm) cement concrete for the base (100 mm thick)	0.2M²	2456.50	490.00
	REINFORCEMENT			
7	9 mm reinforcement steel for the skeletal, rate to include cutting bending & tying	36 kg	28.50	1026.00
8	Man hole cover with lifting hooks	01 No	item	100.00
9	1/2" Bib tap with faucet socket	01 No	item	100.00
10	Transparent water gauge OD 20mm 1.25M high rate to include all connections	01 No	item	65.00
11	OD 50 PVC wash out	0.5	11.70	6.00
12	Drain plug	01 No	item	20.00
13	OD 50 PVC over flow pipe	0.3 M	11.70	4.00
	TOTAL			4448.00

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B.O.Q FOR CONSTRUCTION OF 3500 LITRE FERROCEMENT RAIN WATER TANK AS PER JANUARY 1991 RATES
No overheads and profits

Item	Description	Quantity	Rate SL.Rs	Amount SL.Rs rounded
	EARTH WORKS			
1	Earth excavation in foundation	0.5M³	56.25	29.00
2	Earth filling in foundation and compacting in 200 mm thick layers	0.6M³	22.50	14.00
	R.R. MASONARY			
3	R.R. masonary in foundation with 1:5 cement motar	1.00M³	975.00	975.00
	FERROCEMENT			
4	40 mm thick ferrocement in walls rate to include 2 layers of chicken mesh placed in position as per detail	8.7M²	301.00	2619.00
5	40 mm thick ferrocement roof slab rate to include 2 layers of 25 mm welded mesh placed in position as per detail	2.42M²	301.00	729.00
6	**CEMENT CONCRETE**			
	1:2:4 (20 mm) cement concrete for the base (100 mm thick)	0.3M³	2456.50	1126.00
	REINFORCEMENT			
7	9 mm reinforcement steel for the skeletal, rate to include cutting bending & tying	39.5Kg	28.50	1254.00
8	Man hole cover with lifting hooks	01 No.	item	100.00
9	1/2" Bib tap with faucet socket	01 No.	item	100.00
10	Transparent water gauge OD 20mm 1.65M high rate to include all connections	01 No.	item	80.00
11	OD 50 PVC wash out	0.5M	11.70	6.00
12	Drain plug	01 No.	item	20.00
13	OD 50 PVC over flow pipe	0.3M	11.70	4.00
	TOTAL			7056.00

B.O.Q FOR A CONSTRUCTION OF DUG WELL WITH PARAPET
1.5 M DIAMETER AS PER JANUARY 1991 RATES
No overheads and profits

Item	Description	Rate SL.Rs	Quantity	Amount SL.Rs rounded
	EARTH WORKS			
1	Excavation up to 14 Metres as per current rates (ie for 1st 6' @ Rs.450 and for each additional 6' the rate is increased by Rs.50)		14 M	5000.00
	APRON			
2	Single brick paved floors with 1:3 cement motar	138.75	13.5M²	1873.10
3	20 mm thick Cement rendering to the apron with 1:3 cement motar finished with grey cement float	75.00	18.75 M²	1406.25
	PARAPETP			
4	225mm thick brick work with 1:5 cement motar	255.00	8.7 M²	1957.50
5	20mm thick plaster with 1:3 cement motar with grey cement float for the parapet	75.00	13.6 M²	1020.00
6	Grade 20 concrete with 1:2:4 mix for the cross beam	2456.25	0.05 M³	122.80
7	Steel reinforcement for the beam	28.50	5 Kg	142.50
8	Form work for the cross beam	120.00	0.7 M²	84.00
9	Pulley 4 1/2"	500.00	01	500.00
10	Nut & Bolt to fix the Pulley	50.00	01	50.00
	TOTAL			12156.00

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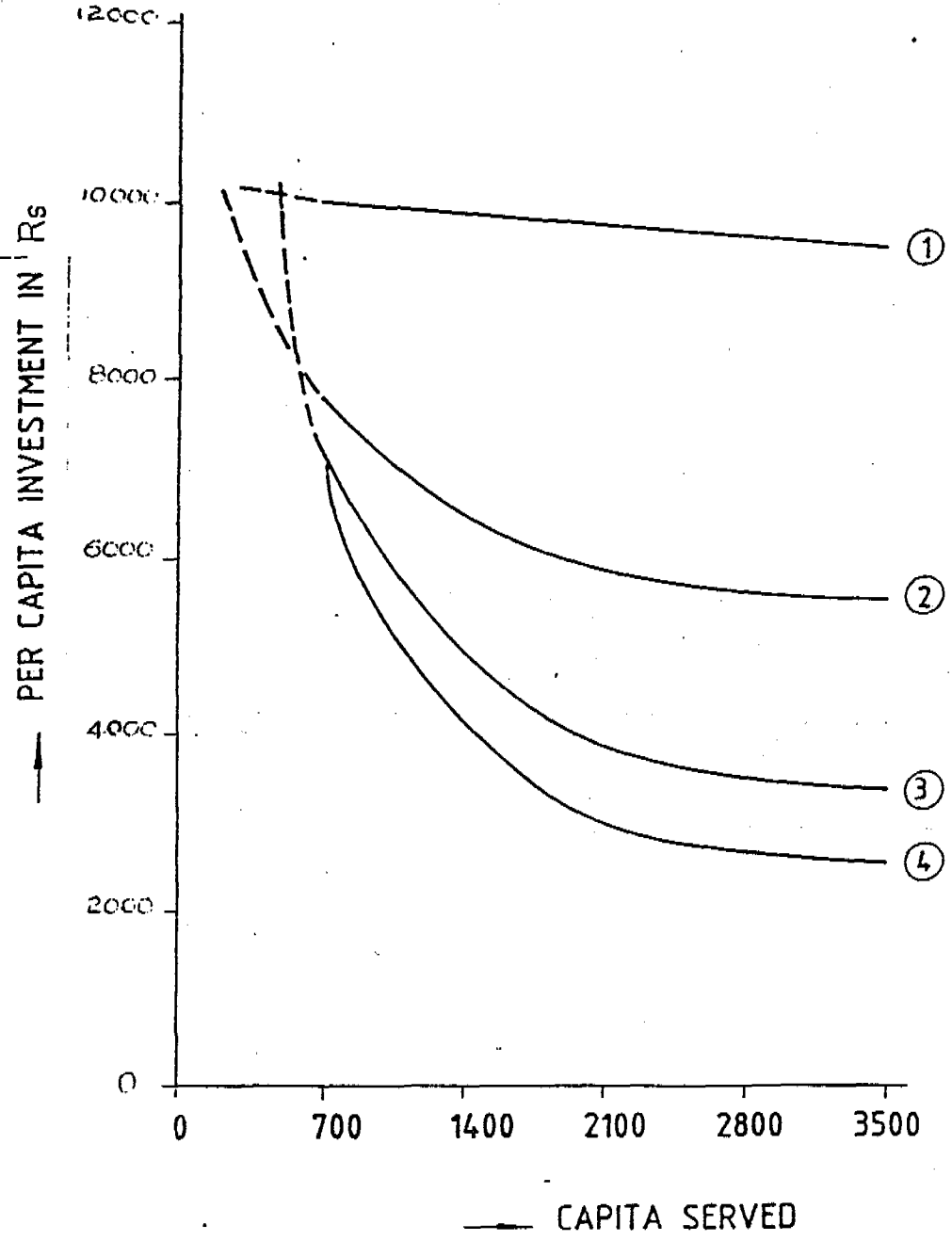
INVESTMENTS IN LOW DENSITY (ARID) COMMUNITIES



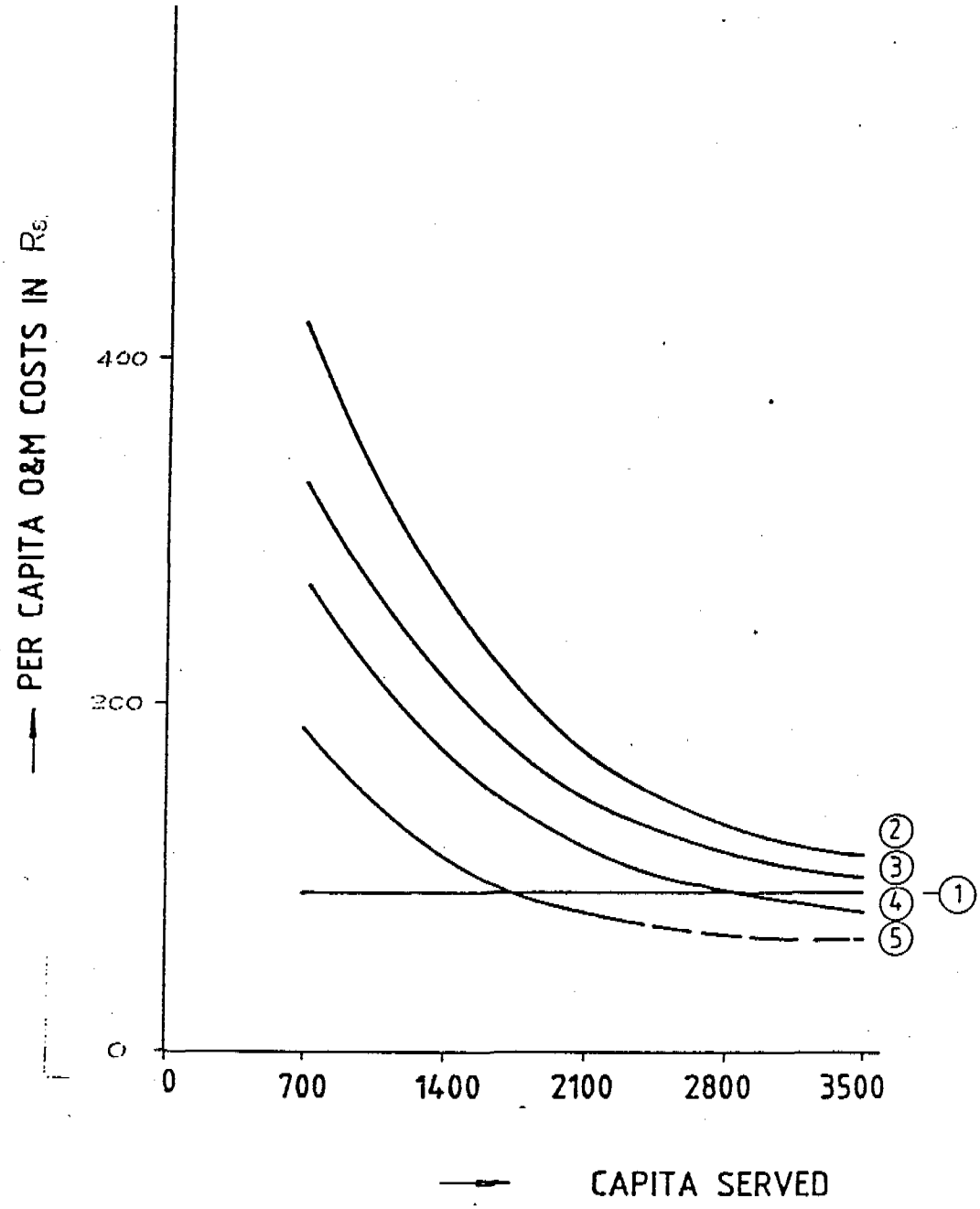
1. HANDPUMPED DEEPWELLS POINT SOURCE
2. DEEPWELLS WITH DISTRIBUTION SYSTEM (SOLAR ENERGY 6 h.)
3. DEEPWELLS WITH DISTRIBUTION SYSTEM (FUEL ENERGY 8 h.)
4. DEEPWELLS WITH DISTRIBUTION SYSTEM (FUEL ENERGY 24 h.)

COST ASPECTS PIPED SYSTEMS

	Investment costs Rs. per capita	Annual operational costs Rs. per capita	Annual recurrent costs Rs. per capita
Gravity spring	1200 - 2500	60 - 100	60 - 100
Pumped groundwater	2000 - 3500	125 - 175	150 - 250
Surface water with S.S.F.	2500 - 3000	200 - 350	250 - 350
Surface water with full treatment	3000 - 6000	250 -350	300 - 450

Note : Distribution system costs between Rs. 1[illegible] and Rs. [illegible] per capita.

OPERATIONAL COSTS, IN LOW DENSITY (ARID) COMMUNITIES



1. HANDPUMPED DEEPWELL (POINT SOURCE)
2. DEEPWELL WITH DISTRIBUTION SYSTEM (FUEL ENERGY 24 h.)
3. DEEPWELL WITH DISTRIBUTION SYSTEM (FUEL ENERGY 8 h.)
4. DEEPWELL WITH DISTRIBUTION SYSTEM (SOLAR ENERGY + STAFF)
5. DEEPWELL WITH DISTRIBUTION SYSTEM (SOLAR ENERGY WITH REGIONAL STAFF)

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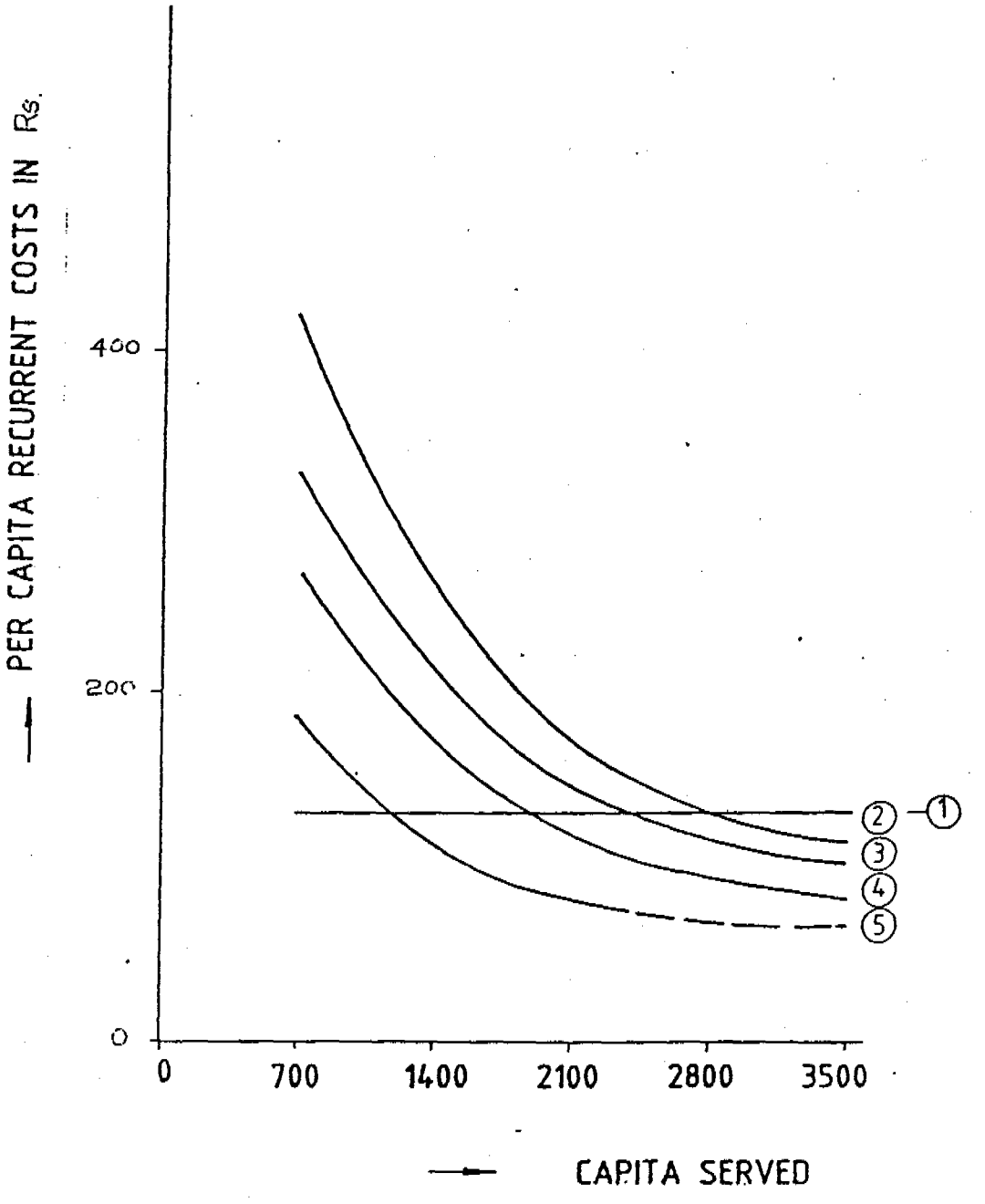
RECURRENT COSTS, IN LOW DENSITY (ARID) COMMUNITIES.



1. HANDPUMPED DEEPWELL (POINT SOURCE)
2. DEEPWELL WITH DISTRIBUTION SYSTEM (FUEL ENERGY 24 h.)
3. DEEPWELL WITH DISTRIBUTION SYSTEM (FUEL ENERGY 8 h.)
4. DEEPWELL WITH DISTRIBUTION SYSTEM (SOLAR ENERGY + STAFF)
5. DEEPWELL WITH DISTRIBUTION SYSTEM (SOLAR ENERGY WITH REGIONAL STAFF)

COST ASPECTS NON-PIPED SYSTEMS.

	Investment costs Rs. per capita	Annual operational costs Rs. per capita	Annual recurrent costs Rs. per capita
Protected springs	200 -1200	4 - 8	4 - 8
Open shallow well	120 - 280	6 - 12	6 - 12
(hand) pumped shallow well	200 - 600	12 - 25	20 - 40
(hand) pumped deep well	600 - 1200	20 - 40	30 - 50
(motor) pumped shallow well	1000 - 2000	60 - 80	100 - 125
(motor pumped) deep well	1200 - 2400	60 - 80	100 - 125
Rainwater harvesting	1000 - 1600	20 - 40	20 - 40

1) = coverage 100 - 200 persons
2) = coverage about 500 persons, including reservoir
3) = coverage 20 persons