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HIS MAJESTY'S GOVERNMENT OF NEPAL

RURAL WATER SUPPLY AND SANITATION PROJECT PREPARATION

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Main Report

Revised Draft Final

Prepared for:

Ministry of Housing and Physical Planning
Kathmandu, Nepal
and
International Development Association
Washington D.C., U.S.A.

Development Alternatives Nepal
P.O.Box 4898
Namaste Lane, Shanta Bhawan
Lalitpur, Nepal

March 1994

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PREFACE

Improvements in rural water supply and sanitation services are priority investments in most developing countries. The conclusions drawn in the RWSSP Preparation study issued in July 1993 have important implications for national policies and investment strategies in the sector, particularly regarding user participation, the role of women, cost recovery, and the roles of the public and private sector. The present study refines the earlier report in light of additional work and the JAKPAS experience.

Team members include Dr. Rajendra B. Shrestha (Team Leader and Economist), Mr. Raj Babu Shrestha (Sanitary Engineer), Mr. Purna Man Shakya (Legal), Dr. Manohar K. Shrestha (Institution), and Dr. Ava Shrestha (Anthropologist).

We appreciate the time and cooperation of Mr. Jacob Pfohl, CTA, JAKPAS, and his team, and the many organizations and individuals contacted during Project preparation. Our appreciation to the IDA review mission for their support and comments, and to Mr. Tashi Tenzing, Resident Mission, World Bank for facilitating the work. A special thank you to Mr. Xavier Legrain (Task Manager, Energy & Infrastructure, SA1EI), for his continued support and interest in the study.

Dr. Ava Shrestha

Shrestha

Managing Director
Development Alternatives Nepal (DAN)

ACRONYMS

ADB	Asian Development Bank
AES	Adult Education Section
AHITP	Animal Health Improvement Training Program
AHW	Auxiliary Health Worker
AIIHP	All India Institute of Hygiene and Public Health
BPEP	Basic and Primary Education Project
B/C	Benefit Cost
BASE	Backward Society for Education
BPT	Break Pressure Tank
CAP	Community Action Plan
CARE	Cooperative for American Relief Everywhere
CBO	Community Based Organization
CBS	Central Bureau of Statistics
CECI	Canadian Center for International Studies and Co-operation
CED	Chief Executive Director
CF	Community Facilitator
CHRDU	Central for Human Resources Development Unit
CHV	Community Health Volunteers
CMA	Community Medical Assistant
CS	Community Supervisor
CWSS	Community Water Supply and Sanitation
DAN	Development Alternatives Nepal
DDC	District Development Committee
DDP	District Development Plan
DDS	Domestic Development Service
DEO	District Education Office

DISVI	Disarmo e Sviluppo (Italian International Cooperation)
DPHO	District Public Health Office
DWC	Drinking Water Corporation
DWRC	District Water Resource Committee
DWSO	District Water Supply Office
DWSS	Department of Water Supply and Sanitation
ENPHO	Environment and Public Health Organization
ERR	Economic Rate of Return
ESC	Environment Sanitation Cell
FED	Forum for Environment and Development
FINNIDA	Finnish International Development Agency
GI	Galvanized Iron
HATS	Horticulture Agronomy Training Support
HDP	High Density Polythene
HELVETAS	Swiss Association for Development and Cooperation
HES	Health Education Section
HF	Hygiene Facilitator
HH	Households
HMG	His Majesty's Government of Nepal
HRDC	Human Resource Development Center
HS	Hygiene Supervisor
HSC	Himalayan Studies Center
HSE	Hygiene and Sanitation Education
HURDEC	Human Resource Development Centre
IDA	International Development Association
IEC	Information Education and Communication
IFCD	Innovative Forum for Community Development

IIDS	Institute for Integrated Development Studies
INGO	International Nongovernmental Organizations
IRD	Integrated Rural Development
JGFFT	Japanese Grant Fund Field Testing (JAKPAS)
KAP	Knowledge Attitude Practice
K-BIRD	Karnali-Bheri Integrated Rural Development
KMTNC	King Mahendra Trust for Nature Conservation
LOU	Letter of Understanding
LTP	Long-term Partnership
LWS	Lutheran World Service
M&E	Monitoring and Evaluation
MHPP	Ministry of Housing and Physical Planning
MIS	Management Information System
MITS	Management Information and Technical Support
MLD	Ministry of Local Development
MOEC	Ministry of Education and Culture
MOF	Ministry of Finance
MOH	Ministry of Health
MPHBS	Multi-Purpose Household Budget Survey
MTRC	Management Training and Research Center
NCA	Nepal Children's Association
NEWAH	Nepal Water for Health
NF	Nonformal Education Facilitator
NFE	Nonformal Education
NFESC	Non-Formal Education Service Center
NGO	Nongovernmental organizations
NHRDI	National Human Resource Development Institute
NJ	Nepal Jaycees

NLRA	Nepal Leprosy Relief Association
NNWA	Nepal National Welfare Association
NPC	National Planning Commission
NRCS	Nepal Red Cross Society
NRs	Nepali Rupees
NS	Nonformal Education Supervisor
NTA	Nepal Tuberculosis Association
NWSC	Nepal Water Supply Corporation
NWSSC	National Water Supply and Sanitation Committee
O&M	Operation and Maintenance
ODA	Overseas for Development Assistance
ORT	Oral Rehydration Therapy
OS	Overseer
PBO	Private Business Organization
PCRW	Production Credit for Rural Women
PHC	Primary Health Care
PHD	Public Health Department
PHO	Public Health Officer
PRA	Participatory Rural Appraisal
PROWWESS	Promotion of the Role of Women in Water and Environmental Sanitation Services
PVC	Poly Vinyl Chloride
RCPHC	Resource Center for Primary Health Care
RDC	Resource Development Training Center
RECPHEC	Resource Center for Primary Health Care
REDD BARNA	Norwegian Save the Children
RRA	Rapid Rural Appraisal
RTI	Research Triangle Institute
RWSS	Rural Water Supply and Sanitation

SA	Support agencies
SAP/N	South Asia Partnership-Nepal
SAPPROS	Support Activities for Poor Production of Nepal
SARAR	Self Esteem, Associative Strengths, Resourcefulness, Action Planning, Responsibility
SASCON	Sand and Stone Consultancy
SCF/USA	Save the Children Federation/USA
SDSS	Sanatan Dharma Sewa Samiti
SNV	Stichting Nederlandse Vlyswilligers (Dutch Volunteer Service)
SOSA	Social Organizational Support Approach
SO	Support Organization
SRDP	Sector Review and Development Plan
SRWSS	Self-Reliance Water Supply and Sanitation
SSNCC	Social Service National Coordination Council
STF	Social Trust Fund
SWC	Social Welfare Council
TA	Technical Advisor
TAC	Technical Appraisal Committee
TBA	Traditional Birth Attendant
TA/DA	Travel Allowance/Daily Allowance
TOR	Terms of Reference
TOT	Training of Trainers
TSS	Tamakoshi Sewa Samiti
UC	User Committee
UMN	United Mission to Nepal
UNDP	United Nations Development Programme
UNESCO	United Nations Education Science and Culture Organization
UNICEF	United Nations Children's Fund

USAID	United States Agency for International Development
USC/Canada	Unitarian Service Committee of Canada
VDC	Village Development committee
VHV	Village Health Volunteer
VMW	Village Maintenance Worker
WB	World Bank
WDA	Women Development Association
WEP	Women Education Program
WHO	World Health Organization
WID	Women in Development
WIF	Worldview International Foundation
WIP	Women Involvement Program
WRA	Water Resources Act
WSS	Water Supply and Sanitation
WSST	Water Supply and Sanitation Technician
WSSTP	Water Systems Support and Training Program
WUC	Water User Committee

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EXECUTIVE SUMMARY

i. Poor water supply and sanitation services continue to be critical problems in rural Nepal despite increasing investments to improve and expand access. Evidence indicates that centrally managed systems do not respond to the needs of the beneficiaries. The government in its role as provider has fostered dependency through heavily subsidized schemes and impeded local and private sector initiatives.

ii. The Sector Review and Development Plan (SRDP) and the Eighth Plan (1992-97) both underscore the need for decentralized planning and implementation through community participation and greater private sector involvement in service delivery.

iii. The proposed Rural Water Supply and Sanitation Project (RWSSP) advocates a demand-led community-based approach, enhancement of the role of women and integration of water supply and hygiene and sanitation education.

iv. The main objective of the RWSSP is to contribute to the economic development of Nepal by delivering sustainable health and hygiene benefits to the rural underserved population through improvements in water supply and sanitation; improving rural real income through time savings for rural women as water supply is brought closer to the dwellings in a cost effective and sustainable manner; and improving the capabilities of sector institutions (both governmental and nongovernmental) to undertake and sustain these efforts.

v. Project Description. The RWSSP includes the following components:

(a) RWSS Fund. A Rural Water Supply and Sanitation Fund (Fund) which would be an independent intermediary agency to manage funds in a flexible, effective and fully accountable manner. It would solicit support organizations (SOs) to implement RWSS sub-projects in partnership with participating communities. It would undertake/support promotional activities, training of support organization (SO) staff, monitoring and evaluation of sub-project performance, material development and technical support;

(b) Water Supply and Sanitation Services. This includes construction of water supply schemes and demonstration latrines, implementation of software components for community capacity building, and hygiene and sanitation education. A fund for lending to construct household latrines would be established. A total of 900 water supply schemes and 1800 sanitation latrines would be constructed benefiting about 0.5 million (design) population. The purpose of software inputs is to prepare and enable communities to take a leading role in planning, implementation and operation and maintenance of their water supplies;

(d) Studies and Sector Development. Studies would include in-home water treatment, health impact studies, detailed demand studies, low cost technology, and policies to promote private provision of RWSS services. Other sector development activities include sector monitoring and development, and a study for preparation of follow-up activities which the Project may need to undertake.

vi. **Selection of SOs and Sub-projects**. Support organizations (SOs) and sub-projects would be selected based on established eligibility criteria. Support organizations would be selected based on staff assessment, track record in undertaking community-based RWSS and related activities, and legal and financial credibility. Schemes would be selected on the basis of need, technical, sustainability, economic, and environmental criteria. The development phase would precede the implementation phase in all rural water supply and sanitation projects.

vii. **Project Cost**. The RWSSP including contingencies, would cost NRs. 954.50 million (US$ 19.09 million) at January 1995 prices. Of these IDA credit would be US$ 15.49 million (81.2%), community contributions would amount to US$ 2.61 million (13.7%) equivalent, and government contribution would represent US$ 0.99 million (5.1%). Project cost includes:

Project Cost (US$ millions)	**Local**	**Foreign**	**Total**
RWSS Fund	2.48	0.97	3.45
Water Supply and Sanitation	6.99	2.84	9.83
Studies & Sector Dev.	0.38	0.58	0.96
Total Base Cost	9.85	4.40	14.25
Physical Contingencies	0.99	0.43	1.42
Price Contingencies	2.85	0.57	3.42
Total Project Cost	13.69	5.40	19.09

Financing Plan (US$ million)			
Community Contribution	2.61	0.00	2.61
HMG Contribution	0.99	0.00	0.99
IDA	10.19	5.30	15.49
Total Project Cost	13.79	5.30	19.09

Estimated IDA Disbursements (US$ million)

IDA\FY	1995	1996	1997	1998	1999	2000
Annual	0.95	1.91	3.00	3.78	4.10	1.75
Cumulative	0.95	2.86	5.86	9.64	13.74	15.49

vii. **Economic Rate of Return**

37.2% for all water schemes
24.5% for the Project

viii. Project Benefits. The RWSSP would benefit a total of 0.[illegible] million (design) population. The estimated ERRs justify economic viability of sub-projects and the Project.

ix. Risks. The main risks of the Project are that the Fund may not have sufficient autonomy to select SOs and sub-projects according to established criteria. The institutional capacity of SOs may not develop quickly enough to be able to utilize Project resources within the given time frame.

I. INTRODUCTION

A. Background

1.1 Poor water supply and sanitation services continue to be critical problems in rural Nepal despite increasing investments to improve and expand access. The failure of investments to result in sustainable services has questioned the role of public institutions in meeting the basic needs of its people.

1.2 Centrally managed service delivery operate on the assumption that people have basic needs for water which must be met, rather than on actual demand and willingness to pay for improved services. Coverage figures for rural water supply evidences that conventional services are neither sustainable nor extended at a fast enough rate. Examples of centrally implemented water schemes which have fallen into disuse and/or abandoned are all too common. The short life span of facilities is due to the failure of the centrally managed system to adopt a demand driven approach, disregard for user preferences, a penchant for overly costly project designs, poor supervision of construction, inadequate arrangements for operation and maintenance, and a lack of accountability to the beneficiaries. This underscores the fact that centrally managed systems contribute little to build capacity or create support structures that represent the interest of users willing to maintain facilities on a long term basis.

1.3 Observations and reviews of successful attempts to meet basic needs suggest that sustainability of water supply and sanitation facilities depend primarily on user willingness to accept responsibility for long term operation and maintenance of the system. This is known to depend on the extent to which users participate during all phases of project planning, implementation and operation and maintenance. If the people are to receive services within the foreseeable future it is judged as imperative that they themselves take action to meet their needs. Under the circumstances the most promising role for the central government is to encourage and facilitate greater private sector involvement in the delivery of rural water supply and sanitation services.

1.4 Until recently the operation and maintenance of rural water supply systems received much less attention than their design and construction. It is becoming increasingly clear that unless these issues are addressed new supplies will rapidly fall into disrepair, the expected benefits will not materialize and the situation will not be any different from its present unacceptable and unsatisfactory state. Donors and nongovernmental organizations (national and international) have recently begun to realize the need to strengthen operation and maintenance arrangements.

1.5 The Sector Review and Development Plan (SRDP) and the Eighth Plan (1992-97) both emphasize the need for community participation, greater user responsibility and ownership, and a larger role for the private sector in service delivery.

1.6 The MHPP Directives for Construction and Management of Water Supply Projects drafted in 1990 and revised in 1991 made it mandatory to form user committees (UCs) as a pre-condition for implementing and maintaining schemes under 1500 population. It failed to rectify the situation. Most government sponsored water user committee (WUC) do not have the mandate of the people and exist more on paper than as effective organizations capable and willing to take on the management of water supplies.

1.7 The Final Interim Report Phase I, Rural Water Supply and Sanitation Project Preparation Study (East Consult, 1992) developed the RWSS Project concept and recommended a demand led community-based approach, enhancement of the role of women, and integration of health and sanitation, and presented several options for institutional improvements within which the delivery mechanism could operate. Following HMG's decision to establish an independent and autonomous Rural Water Supply and Sanitation Fund (hereinafter called the Fund) the RWSS Project Preparation Study Phase II developed and further refined the concepts of the earlier study which led to the issuance of a more detailed RWSS Project preparation report (DAN, 1993). In March 1993 the Japanese Grant Fund Field Testing (JGFFT) project or more commonly called by its Nepali acronym JAKPAS was established to field test and refine a variety of service delivery options, software approaches, and eligibility criteria for the proposed RWSS Fund. The current study (Phase III) incorporates in the Project design additional data and lessons learned from the JGFFT experience.

B. Sector Background

1. Water Supply

1.8 Coverage for rural water supplies fell far short of the expected Water Decade target of 67%. Official 1992 figures indicate only 39% of the rural population have access to drinking water facilities (Table 1.1). These figures overestimate actual coverage as (a) the figures are based on the design population (b) 92% of piped water supply schemes completed by DWSS as of mid 1990 are in need of some degree of rehabilitation (RTI 1990), and (c) 25% of DWSS implemented tubewells are not functioning (SETA 1990). The two major immediate causes for the failure of investments to result in sustainable servies have been poor quality of construction and inadequate arrangements for operation and maintenace. This underscores the need for increasing user responsibility and ownership through more decentralized planning and implementation.

1.9 The Eighth Plan attributes the slow pace of progress to over-ambitious targets; over-programming; lack of institutions for service delivery; and delays in funding and central procurement. These shortcomings highlight the inability of central institutions to deliver local services. In contrast private and NGO implemented schemes that emphasize community participation in all aspects of scheme selection, design, implementation, and operation and maintenance have been more successful to secure community commitment to maintain the system on a long term basis.

2. Sanitation

1.10 The relationship between health and sanitation is well established. Although health benefits are used to justify investments in the water sector 46% of all deaths are associated with diarrhoea and other related diseases. This is because very little resources and effort has been directed to bring about behavioral changes to realize the benefits of improved supplies. Unlike water supply improved sanitation is not a felt need. Provision of services has been supply led with a focus on construction of heavily subsidised latrines which prohibit large scale adoption. Experience makes it clear that technologies imposed on people without consultations are likely to fail or go unused. Only 3% of the rural population are served with sanitation (Table 1.1). The majority resort to open air defecation. The low demand for sanitation reflects a lack of awareness about the relationships between sanitation and good health. With national literacy rate at 40% improvements will require concerted effort to increase people's awareness about disease transmission and identifying ways to bring about desirable changes.

Table 1.1: Rural Water Supply and Sanitation Coverage: Targeted and Actual (%)

Year	1990		1995		1997		2000	
	T	A	T	A	T	A	T	A
A. WATER								
Water Decade	67	34*						
SRDP			50				75	
Eighth Plan					72		100	
B. SANITATION								
Water Decade	13	3						
SRDP			12				25	
Eighth Plan					9			

Source: SRDP 1991; Eighth Plan 1992-1997.
* Actual for 1992 is 39%; T: Targeted, A: Actual

1.11 The National Water Supply and Sanitation Committee (NWSSC) headed by MHPP was created in 1989 to review sector policies and provide guidance for greater intersectoral coordination. Recently in April 1993 NWSSC endorsed a national policy on sanitation and established a Environmental Sanitation Cell (ESC) within DWSS to promote hygiene and sanitation education. The ESC of DWSS is the central point to coordinate activities with concerned ministries such as MOH, MOEC and MLD and has plans to establish sanitation cells in all regional offices where a sanitation supervisor would be held responsible for sanitation activities. Most line ministries in the past, have planned in isolation from each other and there has been very little sharing of resources next door.

C. Sector Institutions

1.12 The lead government ministry in the water supply and sanitation sector is the Ministry of Housing and Physical Planning (MHPP), created in 1988 and given overall responsibility for formulating sector policies, strategies and planning. Under MHPP the Nepal Water Supply Corporation (NWSC) looks after water supply and sanitation in Kathmandu Valley and 10 of the larger municipalities of Nepal, while DWSS is responsible for water supply and sanitation schemes in rural areas and 22 municipalities.

1. Department of Water Supply and Sewerage (DWSS)

1.13 Established in 1972 under the Ministry of Water Resources, DWSS was responsible for implementing urban and large rural water supply schemes. Until 1988, small scale and commu based water supply schemes were implemented by the Ministry of Panchayat and Local Development (now MLD) with assistance from UNICEF. In 1988 the Ministry of Housing and Physical Planning (MHPP) was created. At that time DWSS was transferred to the jurisdiction of MHPP and was designated as the lead agency in the sector. MLD's Community Water Supply Program along with its related staff was turned over to DWSS.

1.14 The MHPP Directives (1990) were designed to apply decentralization measures of His Majesty's Government to the rural water sector. To the extent that the Directives have been observed at all, water user committees continue to be a mere formality and exist only in paper. The Phase I report pointed out a number of problems which prevent DWSS from pursuing a community-based approach. These include:

(a) the technocratic culture of the District Water Supply Office (DWSO) staff resulting in poor relationships between the users and the DWSO staff;

(b) the absence of transparent management and accountability to the users;

(c) low levels of support and inadequate incentives to staff; and

(d) lack of sufficient staff trained in community-based approacnes to RWSS.

1.15 Over programming of RWSS is a common feature of both DWSS implemented or donor assisted rural water supply and sanitation services resulting in projects that take as long as a decade to complete construction. Even after completion most rural water schemes fail to provide the services for which they are constructed. The result is gross wastage of limited public resources. Documented evidence of DWSS performance in the rural water sector leads to the conclusion that there is no justification for a central agency to have a continued independent role in planning and implementing of RWSS schemes. RWSS is a local function and it is time to explore the practicality of community managed RWSS.

1.16 **Central Human Resources Development Unit (CHRDU)**. This unit was established in 1989 to serve as a training center for strengthening human resource capacity of DWSS. The CHRDU is responsible for carrying out a series of training on management, supervision and technical aspects, and trainers training to train village maintenance worker (VMW) and user committee members. At present the center does not have the required staff to meet its objectives. (see Annex 6).

2. Ministry of Health

1.17 The formal health care system caters to only 15 percent of the population. Health services in Nepal are provided by the Ministry of Health (MOH) through institutions and personnel at the central, regional, zonal, district, *ilaka* and village levels. Each of the 75 districts of Nepal has a District Public Health Office (DPHO) and most have a District Hospital (in 11 districts there are no hospital services at all). Currently there are 816 Health Posts one in each *ilaka*, 9 in each district. There is one Village Health Worker (VHW) assigned to each Village Development Committee (VDC). Only 10-20% of the VHWs are female. The VHWs are the key link between the rural communities of Nepal and the network of health services. Accountable to the Health Post In-charge, the VHW is expected to carry out household visits, provide basic treatments and medicines as well as health education, and form mothers groups.

1.18 At the grassroots level the Ministry of Health selects Community Health Volunteers (CHVs). These are local women who are provided with twenty days of training in topics such as immunization, family planning, nutrition, ORT, first aid and postnatal care. The CHV carries a basic first aid kit which is supposedly replenished on a revolving fund basis. They are also responsible for encouraging the adoption of preventive health practices through women's groups. Within the Ministry of Health all health education and sanitation promotion is the responsibility of the Health Post staff and the CHVs.

1.19 The health education materials produced by the Health Education Section (HES) are didactic in nature, relying heavily on a limited selection of printed materials and handouts. The low priority placed on hygiene and sanitation is evidenced by the fact that in 1988-89 only 0.15% of the Ministry's total development budget was allocated for environmental health.

1.20 The Environmental Health Section (EHS) provides training to health field staff on sanitation and hygiene. Depending on their financial resources EHS chorinates wells and storage tank and constructs demonstration latrines in schools and health facilities. Recently it has installed health laboratories in district and zonal hospitals to monitor water quality. At the center the section has 2 sanitarians and 4 assistants.

1.21 As extensive as the network of health institutions and personnel is, the system shows many indications of being weak and ineffective. VHWs have an unrealistic work load, limited training (three months), poor motivation, low remuneration and little supervision (they are supposed to report to the Health Post once a month). During their three months of training only 6 hours is devoted to the topics of personal hygiene and environmental health. Most of the female CHVs are ill equipped to play a catalytic role in mobilizing community women and a very small portion of their training program (3.5 hours) is devoted to personal and environmental hygiene. Most CHVs are inactive.

3. Ministry of Education and Culture

1.22 The Ministry of Education is responsible for developing curriculum for both formal schools and for nonformal adult education (NFE) classes. Health curriculum has been prepared by the Curriculum Development Center and by several experimental projects, such as the UNESCO-funded Seti Education for Rural Development Project, the World Bank-funded Basic Primary Education Project (BPEP) and by the Ministry's Adult Education Section (AES). The BPEP is developing a new primary school health curriculum with emphasis in personal and environmental sanitation. The curriculum is planned to be in effect in 1994 in all schools. Hygiene and sanitation education would be taught for 45 minutes each day, 6 days a week.

1.23 Implementation of NFE through the ministry's District Education Offices has traditionally been weak, due to haphazard selection and limited training of facilitators and inadequate measures for class supervision. The MOEC has made its NFE materials available to NGOs and other government agencies and currently almost 60% of the NFE classes in Nepal are conducted outside the ministry's regular program. Nepal's ambitious target of attaining universal literacy by the year 2000 is hardly reflected by the negligible 0.28% of the annual education budget that is earmarked for adult education. Some financial assistance to MOEC for the production of NFE books is currently being provided by UNICEF and USAID.

4. Donor Support to Rural Water Supply

1.24 Donor support to rural water supplies has substantially increased since the Sixth Plan (Table 1.2). The largest donors during the 1980s in order of assistance provided were UNICEF, FINNIDA and ADB. UNICEF has been assisting rural water supply for over 20 years and, until 1988, was instrumental in developing community-based approaches through the Ministry of Local Development. In the present 1992-96 program, UNICEF is focussing in 33 districts (22 hill and 11 terai) of the Eastern and Central Development Regions. FINNIDA has since 1990 provided assistance to DWSS in all six districts (3 hill and 3 terai) of Lumbini Zone. The Asian Development Bank (ADB) is assisting DWSS in the Eastern, Midwestern and Far Western Regions. ADB has provided 3 loans to support urban and rural water supply projects with minimal community involvement.

Table 1.2: Donor Support to the Sector (Rural and Urban) (NRs. Thousands)

Year	Rural	Urban	Total
6th Plan (1980-85)	139658	295534	437881
7th Plan (1985-90)	540276	340789	892225
1990-93	938863	376219	1316182

Source: Ministry of Finance-Resource Book.

1.25 In addition support has come from many nongovernmental organizations of which the largest are Red Cross, WaterAid, Helvetas, United Mission to Nepal, Gorkha Welfare Trust and Lutheran World Service. The proposed RWSS Project with grant assistance from the Japanese government will be IDA's largest investment to support rural water supply and sanitation.

1.26 Donor contribution to the sector has been significant. It is important that HMG and donors develop and agree on a common line of policy to improve complementarity among agencies. This will require coming to a consensus on basic objectives, approaches, optimal mix of hardware and software, and cost recovery policies. Coordination of donor inputs would effectively improve implementation.

5. Private Sector

1.27 Private sector contribution to the sector has been significant. Most needs for water supply have been met by individual households in the terai through direct purchase from the private sector. The District Development Plan of Kapilvastu prepared by FINNIDA estimates that about 78% of the population are served by private handpumps. Private sector provision of goods and services include:

(a) local industries which manufacture spare parts and equipments for water supply and sanitation facilities;

(b) private contractors who undertake construction work; and

(c) research and development organizations who provide technical assistance to help refine strategies and monitoring and evaluation.

1.28 Poor quality construction due to inadequate supervision is a major problem in the sector. Efforts to ensure high quality parts through international procurement may stifle local initiatives and reduce availability for maintenance. There are 14 major manufacturing firms. A few selected ones could be assisted to facilitate local supply to improve quality and adjust designs to meet local requirements.

D. Water Rights

1.29 To date there exists no comprehensive data on water resources and water use. Management of drinking water resources is guided by customary law. State intervention in community management of drinking water resources is virtually non-existent.

1. Common Practices and Problems

1.30 Water sources located within private property is considered to be the property of the owner. People in the vicinity or nearby villages are given access to these sources not as a matter of right but as charity. When a source located in private land is used the landowner is either provided with a tapstand and/or exemption from payment to capital and O&M contributions. These understandings are either recorded in a minute book or formalized in a written agreement between the landowner and the WUC.

1.31 Where people depend on sources that are not flowing (wells, water holes) there are usually separate water holes for occupational caste groups. When the source is developed for improved supplies the general practice is to provide separate wells for occupational caste groups.

1.32 Most spring sources in the hills are controlled and managed by the community. In present times, because of greater water demands disputes (mainly in hills) over water source is increasing. Water disputes often relate to water sharing within a community for different uses. In practice, upstream users often use drinking water for irrigation at the cost of downstream users.

1.33 In the Terai ground water is an important source of drinking water. Dug wells and tubewells are installed for private use. There is no system of registration of ground water uses. Hence extraction of ground water by private parties remain uncontrolled and unchecked.

1.34 Community members theoretically have equal access to water sources located in public places. Communities having first access to a source is considered to have primary right to it. Public sources which other communities may want to use require prior approval of the community where the source is located. Access to it by another community is usually allowed at a lower point where surplus water may be tapped. A community having prior access to a source would consider residuary water right for other communities.

1.35 Disputes exist due to the lack of clearly defined water rights and a authority to resolve such disputes. Claim to a source based on prior use is contested by another on the basis of location within the latter's jurisdiction. The right of a community to tap a source is contested if the people living upstream is bypassed. If water is sufficient a provision to supply upstream users is made but there is potential for conflict if the source cannot meet the demand of both communities. As a result sources remain undeveloped.

1.36 Intra-community disputes are often referred to local governments and/or CDO for mediation. The ability of local governments to settle disputes is very limited as they are unable to make binding decisions on water allocations. As a result decisions of the VDC/DDC are often disregarded.

1.37 Major problems relating to water rights are (a) lack of a system of registration for water rights; (b) lack of a system of water rights on an appropriative basis; (c) absence of a mechanism to establish priority for drinking water; (d) unclear criteria and institutional mechanism for authoritative allocation of water resources in a decentralized framework; and (e) lack of coordination among water agencies for drinking, irrigation, electricity/power and industry.

2. Legal Provisions

1.38 Some attempt has been made to address the above issues through enactment of the Water Resources Act (WRA) of 1992 (which came into effect on August 17, 1993) and Water Resources Rules (WRR). The WRA requires licencing of new water users but exempts it for following usages:

(a) personal or collective use of water for household maintenance, and irrigation for domestic consumption; and

(b) use of boats for local transportation and for purposes of running water mills as cottage industries.

1.39 Charges are levied for use of water resources developed and distributed by the government or private organizations. In RWSSP the community would use water collectively for household consumption hence would be exempt from licencing (see para 1.38).

1.40 The new WRA establishes priority of drinking water for household consumption followed by irrigation, animal husbandry including fisheries and other agricultural uses, hydro-power, cottage industry and mining, water transport and recreational uses.

1.41 The WRA and WRR enables HMG to constitute a Water Use Investigation Committee to resolve source dispute. The decision of the Committee would be legally binding to all parties concerned.

1.42 Since water disputes occur often it may not be feasible for a centrally controlled committee to tackle the problem. Dispute settlement mechanism has to operate in a decentralized framework.

1.43 In the absence of effective mechanism to allocate and distribute water for different uses customary practices of water use is likely to prevail. It is apparent that settlement of source disputes would be possible only through community consultations, education and consensus.

1.44 In order to address the above issues the legislation would need to make the following changes in the Act and Rules:

(a) A simple procedure of registration of water rights which must clearly define the grounds on which to refuse registration;

(b) The law must recognize customary practices of resolving water disputes. State intervention for resource allocation should be the last resort;

(c) The law must make it mandatory for the community to inform the District Water Resource Committee (DWRC) about the source, command area, quantity of water used and number of population benefited by the scheme. This would enable the DWC to collect data on water resources used for drinking purpose;

(d) DWRC do not have the power to settle water disputes. Power must be conferred to DWRC to resolve local disputes of small sources since the DWRC consists of local officials who would have a better perspective of the nature of source disputes. Water disputes involving more than one district or a dispute involving more than one water agency must be given to Water Use Investigation Committee.

II. THE RURAL WATER SUPPLY AND SANITATION PROJECT

A. Project Objectives

1. **General**

2.1 The proposed Rural Water Supply and Sanitation Project (RWSSP) is a partnership between the Fund, support organizations (SOs) and beneficiary communities. The main objective of RWSSP would be to develop community capacity to plan, implement, operate and maintain RWSS systems effectively on a long term basis. The approach implies a reorientation of sectoral strategies. Instead of being target-oriented as is the current DWSS practice, RWSSP would be demand-driven.

2.2 A pre-selected list of projects to be implemented in accordance with a master plan is not compatible with this approach. The RWSSP would identify ways to increase community capacity and role in planning, implementing, operating and maintaining their water supply systems to ensure long term sustainability.

2.3 Most communities lack experience in cooperative action, are used to depending on government and lack skills and knowledge in hygiene and sanitation issues and technical options. The RWSSP would encourage local community-based institutions to make use of services provided to enhance community capacity. But it is the communities themselves that will organize, plan and implement their schemes to meet their needs and reap the benefits.

2.4 The community-based approach gives a much greater emphasis on software components to raise awareness, identify needs, translate needs into plans, and create local capacity to manage projects. Emphasis will be given to enhance the role of women who are the primary beneficiaries of water supply and who play the key role in efforts to improve family and community hygiene and sanitation (see chapter IV section B).

2.5 Funds would be provided to eligible SOs who will be responsible to undertake projects in partnership with beneficiary communities. SOs would meet established eligibility criteria (chapter IX) to manage hardware and software components of RWSS projects.

2. **Specific**

2.6 More specifically the objective of RWSSP is to contribute to the economic development of Nepal by:

(a) delivering sustainable health and hygiene benefits to the rural underserved population through improvements in water supply and sanitation;

(b) improving rural real incomes through time savings for women as water supply is brought closer to the dwellings in a cost-effective and sustainable manner; and

(c) improving the capabilities of sector institutions (both governmental and nongovernmental) to undertake and sustain these efforts.

B. Area to be Covered

2.7 As a demand-led project it would not be possible to demarcate specific areas to be served by the proposed RWSSP. Given time and budgetary limitations, a geographic focus is appropriate. Within such a focus, RWSSP investments would depend on the capacity of available SOs. Table 2.1 shows that the largest additional population to be served are in the Central, Eastern and Western Regions The Asian Development Bank is focusing in the Eastern, Mid-Western and Far-Western Regions while UNICEF is concentrating in the Eastern and Central Regions.

Table 2.1: Present and Proposed RWSS Coverage in Eighth Plan (1992-1997)

	At the end of 1992		At the end of 1997	
Region	Population benefitted (in 000)	Percent of population benefitted	Additional pop. to be benefitted (in 000)	Percent of population to be benefitted
Eastern	1108	27%	1356	54%
Central	2304	43%	1437	63%
Western	1216	34%	1148	60%
Mid-Western	1210	51%	533	66%
Far-Western	850	53%	377	67%

Source: Eighth Five Year Plan (1992-97), NPC.

2.8 It is anticipated that RWSSP would initially focus on the Central and Western regions, with options for providing support to other areas where real demand is demonstrated and where support organizations are available. The reasons for such a decision are twofold. First, a review of support organizations indicate that they are strongly represented in the Central and Western regions. Project implementation would initially be constrained by the availability of qualified support organizations. Second, a review of coverage and planned investment figures indicate Central and Western regions need priority attention.

2.9 Initial assessment of potential SOs (chapter VI Table 6.15) indicate that in the first year of RWSSP implementation 125 water supply schemes would be implemented. In subsequent years the number of water supply schemes to be constructed each year are likely to increase cumulatively by 50, 75 and 100. The total number of schemes expected to be undertaken by RWSSP is 900 of which 75% would be gravity schemes (including spring protection) and the remaining would be tubewell schemes (see chapter IV section E).

C. Project Benefits and Impact

2.10 The RWSSP would benefit a total of 0.5 million (approx.) design population of which about 0.25 million would be in the hills and 0.25 million in the terai. Project implementation is initially planned for a five year period and it is anticipated that additional IDA and other donor assistance would be available to continue community-based RWSS in subsequent years.

2.11 Time savings in fetching water is the major benefit of RWSS especially to rural women who spend as much as 6 hours each day doing this activity for household maintenance. Time saving benefits of water supply include benefits from reduced time in collection of initial level of water consumption and benefits associated with increased consumption of water. It is estimated that total time saving benefits of improved water supply in the hills are about 4.5 hrs/hh/day (valued at Rs. 1.92/capita/day) for gravity schemes and 0.8 hrs/hh/day (valued at Rs. 0.36/capita/day) in the terai for tubewell schemes (chapter VII). Total estimated benefit from time savings as a result of Project implementation is estimated at about Rs. 48.1 million (US$ 0.96 million) per year.

2.12 Women in rural areas suffer more from malnutrition, anemia and loss of energy due to their heavy work load of which fetching water constitutes a major part. Improved water supplies would ease the drudgery of water collection and save energy expended. It is estimated that in the hills 605 K cal/hh/day (valued at Rs. 4.4 /hh/day) would be saved on average (see chapter VII).

2.13 In addition to time and convenience benefits, there are direct health benefits from improved water quality and quantity resulting in reduced diarrheal and water related morbidity and mortality especially among children (Acharya, 1987). Water borne and water related diseases, particularly infant and child diarrhoea continues to be the leading cause of child morbidity and mortality in Nepal.

2.14 More than one half population in rural Nepal suffer from poverty. Women and children, more than men, are the hardest hit. They suffer from higher rates of malnutrition and morbidity, and have fewer access to resources, education and income than men. Delivery of improved water supply and sanitation by RWSSP would permit women to utilize time saved for more socially and economically productive purposes.

D. Project Development Process

2.15 The RWSSP would form an integral part of rural water supply and sanitation in Nepal. Project cost is estimated at NRs. 954.8 million (US$19.09) million and would be implemented through the creation of a Rural Water Supply and Sanitation Fund (hereinafter called the Fund). The Fund staff would be kept to a minimum. The Fund would sub-contract most of its activities to either support organizations (non-governmental organizations, private sector institutions, local governments and community based organizations) or service agencies (providers of specialized services). RWSS sub-projects would be implemented by support organizations in partnership with beneficiary communities (chapter III). A sub-project would consist of 3-6 schemes preferably in contiguous communities to maximize cost effectiveness. Support organizations and sub-projects would be selected by the Fund on the basis of established eligibility criteria (see chapter IX). The Fund would sub-contract service agencies for activities such as project promotion, training of potential support organizations, site appraisal, monitoring and evaluation, research and development and auditing of Fund's account and sub-project accounts

1. Project Cycle

2.16 The community-based approach involves a substantial change in emphasis from physical infrastructure to software activities to support community capacity building, participatory hygiene and sanitation education as well as a fundamental change in style, emphasizing the community role as the lead agent in implementing and managing its water supply and sanitation facilities.

2.17 To give emphasis to the community-based approach, each project would have a cycle of 12-20 months spread in 2-3 years since communities are available 6 months in a year for RWSSP activities. The project cycle would consist of four phases: pre-development, development, implementation and post-implementation (Table 2.2). The duration of each phase would depend upon scheme size and community capacity to organize and manage RWSS activities (see chapter IV).

2.18 Pre-development Phase (1-2 months). The pre-development phase consists of activities at two levels: the Fund and the community. Fund activities would include promotional activities, review of SO applications, site visits to previous SO activities and selection and orientation of SOs in Kathmandu as well as in the districts. At the community level selected SOs would identify communities through a prefeasibility study (Annex 27) which would assess community needs, source adequacy and reliability, water quality and community capacity to organize (see chapter IV for details). The duration of pre-development phase would be 1-2 months depending upon the number and scheme size. Key outputs of this phase would be selection of SOs, proposal for development phase, and contractual agreements between the Fund and the SOs for development phase financing.

2.19 Development Phase (3-6 months). This phase would enable communities to develop the willingness and capacity to manage their own water supply and sanitation system, and to instil women with the confidence and motivation necessary to increase women's involvement. This phase would include community mobilization/organization activities and hygiene and sanitation education (HSE) to enable communities to develop a community action plan (CAP) as a proposal for implementation and post-implementation phases (see chapter IV for details). The duration of the phase would be 3-6 months depending upon community capacity to organize and take actions. Key outputs would be a representative WUC, a community action plan (CAP) including details of design and technical options considered, agreements regarding community contributions to capital and O&M costs, HSE requirements, a proposal for implementation and post-implementation phases and a contractual agreement between the WUC, Fund and SO for implementation and post-implementation phase financing.

2.20 Implementation Phase (4-6 months). This would include organization and supervision of construction of water supply and sanitation schemes, implementation of construction activities, full scale hygiene and sanitation education, appropriate mitigation measures for any adverse environmental impacts as a result of construction activities, and community support programs including skill and management training, operation and maintenance arrangements and resource mobilization by the WUC. The duration of this phase would be 4-6 months depending upon scheme size and community

Table 2.2 RWSS Project Cycle

Activity	Responsibility	Key Outputs
PRE-DEVELOPMENT PHASE ACTIVITIES (1-2 months)		
RWSSP information	Fund	
Site visits to previous SO activities	Fund	Selection of SOs
SO orientation workshop	Fund	
Prefeasibility study	SO & Community	Request and community willingness to participate and contribute from more than 50% of households
Site appraisal	Fund	
		Contract between Fund & SO for development phase financing
DEVELOPMENT PHASE ACTIVITIES (3-6 months)		
CAP sessions	SO	Representative WUC
NFE (optional)		
HSE CAP sessions	SO & Community	HSE strategy
WUC training		
Design/service level options (CAP)	SO & Community	Selection of design/service level
Preparation of community action plan	SO & Community	CAP as proposal for impl. & post impl. phases
Community contributions to capital & O&M	WUC & SO	Revolving fund for O&M established, and community contributions to capital collected
		Contract between WUC, Fund, & SO for impl & post-impl. phases
IMPLEMENTATION PHASE ACTIVITIES (4-6 months)		
Full scale HSE activities	Women/tapstand groups	Women trained in HSE
Mobilization of labor, material	WUC	Completed RWSS schemes/latrines
Construction of RWSS scheme/latrines	Community & SO	Trained WUC, VMW and masons
Community latrine promotion	Community & SO	Demonstration latrine constructed
Sanitation fund established	Community & SO	Household latrine construction
Trainings (WUC, VMW, HSE, skill enhancement and mason)	SO	Increased technical capacity of community
POST IMPLEMENTATION PHASE (4-6 months)		
Continued HSE	SO	Hygienic & effective use of water
Latrine promotion continue	WUC & SO	Increased use of sanitary facilities
O&M/follow-up	WUC & SO	Increased management capacity of WUC
Technical support to women	So, SA	Enhanced capacity for IG activities
M&E	SO & Fund	Functioning & sustainable RWSS system

Source: Consultant's Assessment

capacity to take action. Tangible outputs would be a completed and functioning water supply and sanitation facilities, trained WUC and VMW, and on-going hygiene and sanitation education and related activities.

2.21 Post-implementation Phase (4-6 months). This would include follow up activities and strengthening of operation and maintenance activities, skill development training for women, regular collection of user charges, continued HSE, promotion of latrine construction, follow-up activities to link-up communities with other credit and income generation activities and monitoring and evaluation to assess time and health benefits of water supply and sanitation sub-projects. This phase would continue for 4-6 months. Key outputs would be consolidation of activities at the community which would result in a sustained and self-reliant rural water supply and sanitation facility, hygienic and effective use of water, and increased linkages with other organizations.

E. Project Components

2.22 The RWSSP would consist of three components:

(a) The Rural Water Supply and Sanitation Fund;

(b) Water Supply and Sanitation Services; and

(c) Studies and Sector Development.

1. **The RWSS Fund** (US$ 4.56 million)

2.23 The RWSSP would be implemented through a Rural Water Supply and Sanitation Fund (Fund) to be created through an Act (Annex 1) which would be ratified by Parliament during the winter 1994 session (see chapter III). As an intermediary agency receiving and managing funds for rural water supply and sanitation the Fund would carry out its mandate in a flexible, effective and fully accountable manner.

2.24 As an autonomous body the Fund would have its own management, accounting and auditing procedures. It would be governed by a 7-member management Board (of which at least one would be a woman) constituted by HMG. Four members would represent the public sector (one member each from the National Planning Commission (NPC), the Ministry of Housing and Physical Planning (MHPP), the Ministry of Local Development (MLD) and the Ministry of Finance (MOF) and three members would represent the private sector including NGOs.

2.25 This component identifies funding requirements for Fund establishment, operation and maintenance (Annex Tables 5-6). It would also include funding for promotional activities, training of Fund staff, technical assistance, monitoring and evaluation, independent audits of Fund activities, training of SOs, material adaptation and development. Projects would be monitored and evaluated to ensure work is progressing as agreed to by partner SOs. These work would generally be contracted to qualified SAs (see chapter VI). But the Fund staff would also make periodic and selective visits to sub-projects.

2.26 Fund Establishment and Recurrent Cost (US$ 2.59 million). This includes all capital costs for vehicles, equipments, furniture and other assets. Recurrent cost includes salary, travel allowance, operating expenses and other repair and maintenance (Annex Tables 5 and 6).

2.27 Promotional Activity (US$ 0.06 million). This includes dissemination of RWSSP information through radio, television and print media and through visits to district based NGOs in the central and western regions to identify potential SOs and CBOs (Annex Table 16).

2.28 Observation/Study Tour for Fund Staff and Board Members (US$ 0.21 million). Board members and Fund staff would be sponsored for observation/study tours to south and south-east Asia to enable them to learn and share experiences of similar RWSS activities. Four observation/study tours would be sponsored each year to Board members and executive staff and two to support staff (Annex Table 15).

2.29 Technical Assistance (US$ 0.56 million). It is anticipated that the Fund would require long term technical assistance in the area of institutional development during the first three years, and several months of short term inputs in the areas of monitoring and evaluation and development of IEC materials. Draft Terms of References for Technical Advisors (TAs) are developed in Annex 23 and would be finalized during appraisal.

2.30 Monitoring, Evaluation and Audit (US$ 0.83 million). This would include regular evaluation of Fund performance, technical and financial auditing of Fund and monitoring and evaluation of sub-projects.

2.31 Training of SO Staff (US$ 0.26 million). In order to strengthen SO capacity to implement community-based water supply and sanitation projects the Fund would arrange for the following workshops and training (see Annex 11 for detail) through contracts to qualified SAs:

(a) 8-day orientation workshops to SO staff (at least two from each SO) in participatory needs assessment, community resource mapping, HSE, community M&E, water yield measurement and water quality testing. The participants would also be introduced to RWSSP philosophy, Fund's book keeping requirements and proposal writing (Annex Table 17).

(b) 8-day training to community facilitators (CFs) on community participation (CAP) processes (Annex Table 24);

(c) 5-day M&E (process, performance and impact) training to SO project managers and/or supervisory staff (Annex Table 19);

(d) 5-day training to overseers and sub-overseers on survey and design (Annex Table 22);

(e) 6-day training to technicians/sub-overseer on construction supervision (Annex Table 23);

(f) 2-day follow-up M&E training to SO project managers and/or supervisory staff (Annex Table 26),

(g) 2-week HSE training to HSE supervisors and hygiene facilitators (Annex Table 25);

(h) 5-day financial management training to SO accountants (Annex Table 21;

(i) 3-day management development training to SO project managers, and.

(j) 1-day Fund-SO exchange program to share experiences and follow-up.

2.32 Material Development (US$ 0.04 million). The Fund would support development of IEC materials for specific software components such as participatory hygiene and sanitation education, participatory rapid appraisal methods and a manual for O&M. It would also support social marketing strategies for dissemination through mass media and hardware (audio-visual facilities) and a preparation package to develop further follow-up programs incorporating lessons learnt and experiences gained from the present community-based approach.

2. **Water Supply and Sanitation Services (US$ 13.29 million)**

2.33 This component would include prefeasibility study, and software activities (community organization/mobilization, NFE and HSE) to prepare communities to take full advantage of time and health benefits of water supply and sanitation services. This component includes funding for construction of water supply and sanitation schemes, promotion of demonstration and private latrines and catchment protection for hill schemes.

2.34 Prefeasibility Studies (US$ 0.06 million). In each community the prefeasiblity study would assess community needs, source adequacy and reliability, community capacity to organize and willingness to participate and contribute (see chapter IV for details and Annex Table 28).

2.35 Software Activities (US$ 4.02 million). The Fund would support software activities during development, implementation and post-implementation phases. These include the following:

(a) Community Organization/Mobilization. This entails preparing the communities for full participation leading to the formation of a representative water user committee (WUC) capable of implementing a community-based RWSS scheme. The RWSSP would support the salary and travel allowance of a community facilitator (CF), hygiene facilitator (HF), NFE facilitator (see chapter IV para 4.6-4.8) and a technician including supervision cost of central level software and hardware staff and materials. The CF would be responsible for creating an environment which would allow communities to engage in a process that enables them to organize into groups and build confidence. It is expected that a CF, HF and one technician would be able manage 3 schemes (chapter VI). Supervisory staff would be e to oversee 6 schemes on average. The technician would in e the community through WUC members in all aspects of the f bility study to ensure user acceptability of design.

(b) Nonformal Education. It is anticipated that 50% of the communities would require NFE during the development phase (see chapter IV). The RWSSP would support the cost of materials and facilitator salaries. NFE classes would be held at the rate of one class per 100 beneficiary population (see chapter IV para 4.54-4.56).

(c) Hygiene and Sanitation Education. A program of hygiene and sanitation education to reach at least one women from each household of the beneficiary population through promotional (mass media and social marketing) and participatory (problem solving) approaches on hygiene and sanitation related issues, causes/effects, and prevention including promotion of latrine construction and environmental sanitation activities. Health CAP sessions and health KAP would form the basis for HSE. The HF would assist women in their efforts to modify changes in personal, domestic and environmental hygiene and sanitation. This would include orientation and training of women/tapstand groups, village health workers (VHWs), opinion leaders, traditional birth attendants (TBAs), and school teachers and children.

(d) Support to women. The project would support women in planning and implementation of water supply schemes; provide skill enhancement training to improve women's access to the formal credit systems; and operation and maintenance and HSE trainings (see chapter IV para 4.38).

2.36 Water Supply (US$ 8.46 million). Construction of water supply facilities would begin only after the development phase. The number and types of schemes to be implemented during the project period are shown in chapter IV section E). The RWSSP would provide potable water to about 0.5 million people (design) in the hill and terai areas of Nepal. It would support 900 water supply schemes. Water supply services would include spring protection (33), gravity flow systems (642), shallow tubewells (183) in most of terai, and deepwells (21) and dugwells (21) in certain areas of terai where other options are not feasible. Costs to the Fund would include survey and design, material, skilled labor, tecnnical assistance, environmental mitigation measures and SO overhead. In gravity schemes all unskilled labor, local materials, and minimum 1% of capital cost would be borne by communities. In tubewell schemes 12% of capital cost in cash, and porterage would be borne by communities. In all schemes all operation, maintenance and repair costs would be fully borne by communities.

2.37 Sanitation (US$ 0.58 million). Hygiene and sanitation value of latrines would be promoted through the HSE program. Two demonstration latrines per scheme would be supported by the Fund in suitable public places preferably schools/health post to encourage hygiene and environmental sanitation. The cost of demonstration latrines would be US$ 0.27 million. With an effective HSE program it is anticipated that about 40% of households in the hills and 50% in the terai would request assistance to build private latrines during implementation and post-implementation phases. It is anticipated that there may be additional 15% demand for private latrines in subsequent years. Complete coverage in the community may take about 6 years. The Fund would provide assistance for appropriate sanitation facilities to community through a sanitation revolving fund for lending to approximately 25%

of beneficiary households. This would cost US$ 0.31 million in 900 communities. The sanitation revolving fund for lending to community members would be managed by the water user committee (WUC). It is suggested that households make a cash deposit of NRs. 150 (40% of the cost of a simple cement slab and a pan) in the hills and NRs. 300 (30% of the cost of six rings and a slab) in the terai (see chapter IV para 4.93-4.97). The balance would be repayable in the form of a loan to be repaid in 1-2 years time. Lending terms and conditions would be decided and managed by the WUC.

2.38 Catchment Protection (US$ 0.17 million). The RWSSP would support environmental impact mitigation activities such as community tree planting for source protection (Annex Table 36).

3. Studies and Sector Development (US$ 1.24 million).

2.39 There would be a need for a number of applied research and development studies to be undertaken during the implementation and post-implementation phases. The RWSSP would include funding for several studies and research and development activities designed to: (a) improve information available to policy makers in designing sector policies, and (b) test improved methods and techniques in software as well as hardware. Studies identified are:

(a) Health KAP and Impact Studies (US$ 0.28 million) . This study would assess the impacts of different project interventions on the health status of project populations. The ultimate aim would be to identify cost-effective methods for securing health impacts (see chapter V for details).

(b) In-home Water Treatment Methods (US$ 0.13 million). This study would review current methods for in-home water treatment and test the cost-effectiveness and the acceptability of alternative measures (see chapter V).

(c) Low Cost Technologies (US$ 0.08 million). The purpose of this series of studies would be to test technologies which promise lower costs and better availability to rural communities (see chapter V).

(d) Detailed Demand Studies (US$ 0.13 million). The purpose of these studies would be to develop accurate estimates of the components of economic benefits from water schemes i.e. changes in water consumption, changes in cost, time savings (see chapter V for details).

(e) Policies to Promote Private Provision of Rural Water Supply and Sanitation Services and Inputs (US$ 0.07 million). The purpose of this study would be to carry out a thorough review of the constraints to private sector supply of rural water supply and sanitation inputs including materials, pumps, spares, latrines, and chemicals for treatment(see chapter V).

(f) Preparation of a Follow-up Project (US$ 0.31 million). A preparation package to develop further follow-up programs incorporating lessons learnt and experience gained from the present community-based approach.

(g) Special Sector Monitoring Activity (US$ 0.23 million). It would include funding for special sector monitoring activities which would be managed by NPC. It would monitor and evaluate implementation performance of a sample of SOs and project impacts. Specific studies would be carried out during the RWSSP period to generate information on successes and failures to provide essential inputs for defining future policies and investment decisions.

F. Project Costs

2.40 Total RWSSP cost including contingencies, are estimated at NRs 954.81 million (US$ 19.096 million). Foreign exchange component is NRs. 270.58 million (US$ 5.411 million), or 28.33% of project costs. A summary of cost estimates is provided in Table 2.3. Detailed cost estimates are provided in Annex Table 1.

2.41 Base cost estimates are adjusted to January 1995 using inflation factors for foreign and local components (World Bank guidelines). A 10% physical contingency and price contingencies of 6.5% in 1995 and 6% thereafter for local expenditure and 3.1% in 1995, 3.2% in 1996 and 3.1% thereafter for foreign expenditure have been allowed. Foreign exchange conversion have been calculated in accordance with World Bank guidelines. Local and foreign cost components are calculated based on tax and duties applied for different RWSSP components.

Table 2.3: Summary of Cost Estimates for RWSSP (In '000 US$)

Particulars	In '000 US$				In '000 NRs.			
	Local	Foreign	Total	Total With Contingenc	Local	Foreign	Total	Total With Contingency
RWSS FUND	2481.90	971.05	3452.94	4557.49	124094 95	48552.30	172647 24	227874 48
Capital Cost	155 09	171 81	326 90	402 78	7754.55	8590.39	16344.94	20138 55
Recurrent Cost	1507.21	101.50	1608.70	2185 19	75360 26	5074 86	80435 12	109259 35
Institutional Development cost	819.60	697 74	1517 34	1969.53	40980.14	34887 05	75867.18	98476 28
WATER SUPPLY AND SANITATION	6990 83	2842 34	9833.17	13296.63	349541.29	142117.11	491658.40	664831.49
A. Pre-Development Phase								
Pre-Development Studies	41 11	2.16	43.27	56 55	2055 33	108.18	2163.50	2827 71
B. Development Phase								
Software	661 86	34 83	696 69	910 36	33092.78	1741.73	34834.50	45518.01
C. Implementation Phase	5155.89	2675.91	7831 80	10494 75	257794.37	133795 54	391589 90	524737.62
Water Supply	3811.52	2541 01	6352.53	8457 03	190575 84	127050.56	317626.40	422851.31
Catchment Protection	88.21	4 64	92.85	128.47	4410.38	232.13	4642 50	6423.32
Sanitation	132.03	71.09	203.12	271 94	6601 40	3554 60	10156 00	13596 89
Software	1124.14	59 17	1183 30	1637 32	56206.75	2958.25	59165.00	81866.09
D. Post Implementation Phase	1131.98	129.43	1261.41	1834.96	56598.83	6471.68	63070 50	91748.15
Sanitation	[illegible].79	77 42	221.21	311 17	7189.33	3871 18	11060.50	15558.27
Catchment Protection	35 27	1 86	37.13	54.39	1763.68	92.83	1856.50	2719 39
Software	952.92	50.15	1003 07	1469.41	47645 83	2507.68	50153 50	73470 49
STUDIES AND SECTOR DEVELOPMENT	376.46	585.52	961.98	1242.10	18822 86	29276.02	48098 88	62105.13
Total Base Cost	9849.18	4398 91	14248.09		492459 10	219945.43	712404.52	
Physical Contingencies (10%)	984.91819	439 8908	1424.8090		49245 91	21994 54	71240.45	
Price Contingencies	2850.5281	572.7943	3423 3225		142526.41	28639 72	171166 13	
Total Project Cost	13684 628	5411 594	19096.222	19096 222	684231 41	270579 69	954811 10	954811.10

Source: Consultant's Estimate

G. Financing Plan

2.42 The proposed IDA credit of US$ 15.5 million (NRs. 774.9 million) equivalent would finance 81.2% of project costs. Government contribution will be in the form of taxes and duties covering 5.1% of the total RWSSP cost. Beneficiary contributions in cash and kind, valued at about US$ 2.61 million equivalent (13.7% of total Project cost) would finance all unskilled labor, locally available materials, porterage and some equipment. The RWSSP financing plan is summarized in Table 2.4 (details in Annex Table 3).

2.43 The Ministry of Finance (MOF) would facilitate and authorize the flow of IDA credit to the RWSSP in the form of block grants through a special account in Nepal Rastra Bank which will be reflected in the annual budget of the government. Transfer of funds from the special account to project account will be made upon approval of projects by the Board.

Table 2.4: Financing Plan for RWSS Project
(US $ '000)

Particulars	In '000 US$ Local	Foreign	Total	Total With Contingenc	In '000 NRs Local	Foreign	Total	Total With Contingency
IDA	7258.19	4398.91	11657 10	15497.65	362909 62	219945.43	582855.04	774882 30
HMG	712.40		712 40	985 15	35620 23		35620 23	49257 50
Community Contribution	1878.59		1878.59	2613.43	93929.25		93929.25	130671.30
Water Supply	1837 97		1837 97	2556 92	91898 25		91898 25	127845.34
In Cash	121 84		121 84	169 52	6092 05		6092 05	8476.03
In Kind	1716 12		1716 12	2387 40	85806 20		85806 20	119369 81
Sanitation								
In Kind	40.62		40 62	56 51	2031.00		2031 00	2825.46
Total Project Cost	9849 182	4398 909	14248.090	19096 222	492459 10	219945.43	712404.52	954811.10

Source: Consultant's Estimate

H. Procurement

2.44 All procurement of services, goods and civil works would be carried out in accordance with World Bank procurement guidelines, except as noted below. Fund equipment purchases for its own use are expected to be minor and would be subject to prudent shopping. Most procurement under the

RWSSP would consist of contracts to SOs. Support organizations (SOs) would be contracted on a sole source basis. Competitive bidding procedure will be encouraged where applicable.

2.45 Two SO contracts would be made. One for development phase financing, and the other for implementation and post-implementation phase financing. TORs attached to each SO contract would specify terms and conditions, milestones, disbursement mechanism and monitoring and reporting.

2.46 Payments would be made according to schedule to ensure activities are undertaken during each phase and completed on time as specified in the TOR. Proposed payment schedule for each phase is as follows:

1. **Development Phase**. Payments for development phase would be made on the basis of milestones achieved and satisfactory work performance.

- 30% initial advance payment to SOs for development of sub-projects which will cover staff recruitment as agreed, formation of WUCs and commencement of community action plan (CAP).

- 40% interim payment to SOs on full staff recruitment, training of WUC members, undertaking CAP exercise including health KAP baseline, initiation of software activities as proposed and on submission of accounts and progress report.

- 30% final payment on initiation of WUC registration process, collection of cash contributions for construction and O&M fund, HSE activities, submission of a satisfactory implementation phase proposal and on submission of accounts and progress report.

2. **Implementation and Post-Implementation Phase**. Payments for implementation and post-implementation phase would consist of hardware and software costs. Implementation phase contract would be required for procuring materials and meeting other software costs. Based on discussions with manufacturing suppliers and SOs and in line with the World Bank procurement guidelines the following payment arrangements to SOs are suggested:

- 20% initial advance payment of total contract value plus payments for material purchase and delivery to SOs (on presentation to the Fund of quotations from reputable manufacturers or suppliers approved by the Fund and in accordance with prudent shopping rules).

- 40% interim payment of total contract value less materials on completion of WUC, VMW, HSE and mason trainings and submission of financial statements with supporting documents.

- 40% final payment of total contract value less material on completion of demonstration latrines, refresher HSE training, follow-up activities of post-implementation phase, registration of WUC and on submission of financial statements and scheme completion reports with supporting documents.

2.47 Payments would be stopped .. any time if SO/SA performance are found to be unsatisfactory or are found to be misusing funds.

2.48 The Fund would develop standards/norms to ensure quality control of materials. In areas where material supply is not available locally the Fund can assist SOs in identifying reliable suppliers. This problem is likely to be minimal but would need to be further assessed during the JAKPAS project.

2.49 One option would be to adopt centralized procurement system with the Fund negotiating directly with suppliers to deliver needed materials to SOs on demand as practiced by FINNIDA. This has the advantage of ensuring quality and standard of materials at bulk rate. The other option would be the decentralized procurement system in which SOs would manage the procurement of materials from selected list of suppliers (approved by the Fund). Yet another option would be for SOs to place orders to suppliers and the Fund makes payments directly to the suppliers on presentation of bills and evidence of delivery.

I. Disbursements

2.50 On the basis of the proposed implementation schedule disbursements of IDA funds would continue for six years. The proceeds of the credit would be disbursed, net of taxes and duties, as outlined in the disbursement schedule (Table 2.5)

2.51 All disbursements would be made against statements of expenditures, the documentation for which would not be submitted to IDA but retained by the Fund, and made available during the course of project supervision.

J. Monitoring and Evaluation

2.52 Monitoring and evaluation would play an important role in ensuring efficient implementation, and in providing a basis for reflecting RWSSP experience in subsequent operations. Monitoring indicators would focus on the rate of implementation, the extent to which benefits are being realized, assessment of the cost-effectiveness of interventions and a review of the suitability of RWSSP policies including criteria for selecting SOs and schemes.

2.53 The RWSS Fund concept implies the development and testing of new institutional and socio-tecnnical approaches to service delivery, since existing centralized approaches have had limited impact. A major RWSSP objective is to bring the delivery of water and sanitation services within control of communities. Such a policy requires continuous monitoring and evaluation of institutional and service delivery approaches to ensure that the Fund meets its objectives and facilitates changes.

Table 2.5: IDA Disbursement Schedule of RWSS Projects (US$ '000)

IDA Fiscal Year	Quarter Ending	Disbursement	Cumulative Disbursement	Annual Percentage %	Quarter
1995	Jan 1, 1995	413 24	413.24	43.46	1
	March 31, 1995	179.15	592.39	62.30	2
	June 30, 1995	179 29	771.68	81.15	3
	Sept 30, 1995	179 18	950 86	100.00	4
1996	Jan 1, 1996	756 01	1706 8	39.43	5
	March 31, 1996	387 11	2093 9	59 62	6
	June 30, 1996	387 12	2481.10	79.81	7
	Sept. 30, 1996	387 11	2868.21	100.00	8
1997	Jan 1, 1997	1146.72	4014.93	38.37	9
	March 31, 1997	614.16	4629.0	58.92	10
1997	June 30, 1997	613.86	5242 95	79 46	11
	Sept. 30, 1997	613.86	5856 81	100.00	12
1998	Jan 1, 1998	1472.91	7329.72	38.91	13
	March 31, 1998	770.72	8100.44	59.27	14
	June 30, 1998	771.09	8871 53	79.64	15
	Sept. 30, 1998	770.72	9642.25	100 00	16
1999	Jan 1, 1999	1507.15	11149 94	35.89	17
	March 31, 1999	897 41	12046 81	57.26	18
	June 30, 1999	897 41	12944.22	78.63	19
	Sept. 30, 1999	897 41	13841.63	100 00	20
2000	Jan 1, 2000	425.29	14266.92	24.15	21
	March 31, 2000	445 19	14712.11	49.43	22
	June 30, 2000	445 36	15157 47	74 72	23
	Sept 30, 2000	445 20	15602.67	100 00	24

Source. Consultant's Estimate

2.54 Objectives The broad objectives of M&E would be to

(a) provide regular information on the progress of each RWSSP activity and to compare progress with stated objectives in terms of time and cost;

(b) provide feedback on RWSSP implementation efficiency and suggest improvements;

(c) provide feedback on RWSSP effectiveness in achieving its stated objectives; and

(d) provide estimates on RWSSP impact on hygiene and sanitation and improvements in rural real incomes.

2.55 Monitoring and Evaluation. Monitoring and evaluation would take place at two levels: the Fund/RWSSP and SO/project level. It would consist of three parts: performance monitoring of the Fund/SOs, process monitoring and impact evaluation of projects. The three types of M&E have different purposes and would be used in an integrated monitoring and evaluation program. M&E would be closely coordinated with all phases. A framework for M&E is included in Annex 21.

(a) Performance Monitoring. The purpose of performance monitoring would be to take timely decisions for effective project completion. This would regularly assess the adequacy of the functions and services of the Fund, SO/SAs and communities, in terms of their performance against contractual obligations and related terms of reference. The effort will be the core of the M&E system. It will focus on the adequacy of inputs and outputs at all levels and especially in terms of financial and human resources, contracting and implementation of projects. A framework for performance M&E is included in Annex 21a.

(b) Process Monitoring. Process monitoring will provide feedback to the Fund on the efficiency and effectiveness of the methods used in project implementation. In particular it would assess how the project is perceived by the beneficiaries, and the adequacy of linkages and communications between the Fund, SOs and communities. It will assess the institutional and socio-technical approaches undertaken and attempt to determine and continuously refine institutional arrangements, training curricula and materials, communications support, and policy and operational guidelines. Process monitoring would include periodic visits to observe the process of change over time. Observations would be made at the start of the project when community groups are being formed and initial orientation given, when the process is well underway and when the process has been completed. A framework for process monitoring is attached in Annex 21b. The JGFFT experiences would be updated in the Final Report.

(c) Impact Evaluation. Impact evaluation would estimate the net impacts of the project on the target population by comparing the conditions of the beneficiaries before and after the project. The JGFFT has developed a detailed impact monitoring system and tools and is field testing and refining it currently. The system is described briefly in Annex 21c.

2.56 In keeping with other project components, the M&E system is participatory and aims at helping the Fund, SOs and communities improve their performance, learning on process issues and impact.

2.57 The RWSS Fund M&E officer, will be responsible for overall M&E/MIS operations and will be assisted by short term expatriate consultant to set up the M&E system at the Fund. Each Fund staff will have a portfolio of projects which she/he tracks in terms of contractual performance. Narrative and financial reports will form the first line of information on the progress of individual projects. Field visits by Fund staff and technical and auditing firm will confirm project progress. Performance monitoring of the RWSS Fund will be conducted by an independent service agency.

2.58 Process monitoring and evaluation will be managed through contractual arrangements with a service agency (SA). The SA will work in close coordination with RWSS Fund staff and report to the Fund's CED and to the M&E Officer. Teams of SA specialists will visit selected project sites on a quarterly basis throughout the project cycle. Process monitoring will address key policy and best practice issues. Indicators will be developed to analyze achievements of RWSSP objectives, speed of implementation, cost, efficiency of organizational procedures and inter-agency interactions, quality of project outputs, accessibility to beneficiaries and replicability.

2.59 Each component of project activity will be studied through participatory rapid appraisal methods criteria and methodology issues will be carefully analyzed using qualitative and quantitative information. The SA will make recommendations to improve linkages and communication between the Fund, SO, SA and the community. Careful process documentation will be a key aspect of process monitoring. Focus questions will be selected according to key management and learning issues as determined by the Fund Board and staff.

2.60 Impact monitoring at the community level will include the active involvement of beneficiaries. The Project will monitor key indicators as defined in Annex 21c which would include assessment of time savings, improvements in personal and domestic hygiene and environmental sanitation, increases in water consumption level, and improvements in income. All communities, with facilitation from SOs, will be expected to carry out a minimal impact evaluation . will report the results to the Fund. PRA and similar techniques will be used in keeping with the community-based principles of RWSSP. Impact assessment will be based on a package of research methods (qualitative and quantitative) to ensure validity and reliability of information. The JGFFT is currently testing an impact M&E system with SO/communities in the field and has developed computer software for processing project information on a community by community basis. Thirty percent of RWSSP beneficiary households would also complete health KAP studies as outlined in Annex 14.

2.61 At the end of the project an evaluation team consisting of a technician and social scientist would conduct impact evaluation of a sample of completed schemes. The team would look at use of water supply and sanitation facility, its appropriateness, and arrangements made for its operation and maintenance. The team would also assess water use, time saved, changes in hygiene and sanitation behavior and the functioning of the water user committee.

K. Risks

2.62 The success of the RWSSP would depend upon the effectiveness of the Fund and its efficient functioning. The Fund may not be given sufficient autonomy or be free from political influences on management. Selection of the Board and the Chief Executive Director (CED) is critical to the Fund's effectiveness. The role of the CED must be one of promoter and facilitator, not a traditional administrator of funds. It is imperative that the selection of the CED be free from political influences.

2.63 Another risk to RWSSP is that fund flow to projects may not be timely with implications for overall Fund performance.

2.64 Most SOs need strengthening in order to execute projects effectively. They may not be able to get experienced technical staff which may result in systems that are inappropriate and unaffordable to users. It is assumed that training institutions would be available or would emerge that can strengthen SOs, but the institutional capacity of SOs may not develop quickly enough to be able to utilize RWSSP resources within its time period.

2.65 The expected outputs of the development phase may not be realized as anticipated. Water user committees (WUC) may not be representative or gender-sensitive, may not be able to collect adequate funds for O&M or source disputes may not be solved in time. Agreements with WUC and collections for O&M (after the first year up-front contribution) may be difficult to enforce which may reduce project effectiveness unless credible mechanism to enforce agreements are in place between the WUC, SO and the community. In addition to relying on social pressure alone arrangement for some form of sanction may be needed to ensure user compliance.

2.66 Regular and routine support to WUC and individual users beyond the post-implementation phase activities may not be readily available because some SOs would no longer be there and government extension personnel who were not involved in project implementation may not be willing to provide assistance. Follow-up activities of RWSSP would need to address the issue of communication channels for future technical support.

2.67 If HSE programs are not carried out effectively the anticipated health benefits and behavioral changes in hygiene practices would not be realized. Extra attention would need to be given to SOs to upgrade their technical capacity to undertake HSE activities.

2.68 Sustainability of investments in rural water supply would be at a greater risk if there are inadequate institutional and funding arrangements for system operation and maintenance. These risks would be minimized by strict adherence to eligibility criteria established for SO and scheme selection, training, and timely monitoring and evaluation.

III. THE RURAL WATER SUPPLY AND SANITATION FUND

A. Rationale for the Fund

3.1 The Eighth Plan underscores the importance of institutional change through decentralization of service delivery to local governments and the private sector (see chapter I para 1.5-1.7). The RWSS Fund would provide a new institutional framework to support HMG's commitment to facilitate decentralized planning and greater private sector involvement in rural service delivery. The RWSS Fund Act (Annex 1) foresees strong autonomy for the Fund in achieving its objectives. The Fund would (a) provide support to strengthen demand-based RWSS services, (b) strengthen SO capacity to serve as competent resources to beneficiary communities, (c) institutionalize participatory approaches to RWSS, and d) monitor and evaluate implementation of RWSS projects.

3.2 The overall goal would be to enhance development of sustainable and effectively-used RWSS services in Nepal on a larger scale. The Fund would be responsible for financing water supply and sanitation services through timely release of funds to SOs and SAs in partnership with user communities in a flexible and fully accountable manner.

B. Objectives

3.3 The primary objective of the Fund is:

(a) to promote sustainability, reliability and cost effectiveness of RWSS services through community-based approaches; and

(b) to provide necessary financial, technical and institutional support to local community to implement their own RWSS schemes in partnership with SOs that meet established eligibility criteria (see chapter IX).

C. Functions

3.4 The Fund as an intermediary and facilitator of RWSSP would concentrate on developing activities, providing technical and management assistance including training of SOs, disbursement of funds to SOs upon satisfactory evidence of community involvement, and monitoring and evaluation of projects. SO capacity building activities and monitoring and evaluation of projects would be contracted to eligible Service Agencies (SAs). The Fund would have its own monitoring system to oversee SO and SA activities. The specific functions of the Fund would be:

(a) to inform and clarify RWSSP objectives to potential SOs and local communities either through umbrella organizations or through other channels. This function would be contracted to appropriate SAs;

(b) to enhance community awareness and arrange technical and management assistance including training services to SOs, and facilitate partnership arrangements between SAs and SOs. The primary objective of the training would be to improve SO capacity to implement community-based rural water supply and sanitation projects. These activities would also be contracted;

(c) to assess and select SOs and schemes on the basis of transparent eligibility criteria (chapter IX);

(d) to enter into agreement with SOs in the development phase, and a tripartite agreement between the water user committee (WUC), Fund and SO for implementation and post-implementation phases. The agreement would define relationships between stakeholders and establish direct communications between the Fund and the SOs;

(e) to develop transparent procedures for the flow of funds and disbursement to SOs and SAs;

(f) to develop appropriate procedures for monitoring and evaluation and performance indicators for the Fund (Annex 21). Participatory evaluation methods would be emphasized. Monitoring and evaluation of sub-projects would be contracted to SAs. Regular monitoring and reporting as well as impact evaluation would be undertaken. The Fund would also send its own staff to project areas to spot-check the activities of SOs and SAs;

(g) to strengthen SO capacity to engage in RWSS activity;

(h) to carry out periodic research and development studies on topics relating to rural water supply and sanitation sector through SAs;

(i) to acquire financial, technical and material assistance from national and international organizations, bilateral and multilateral donors for RWSS; and

(j) to advise HMG in formulation, execution and coordination of a national policy on rural water supply and sanitation.

D. Legal Framework

3.5 The draft Act for the RWSS Fund (Annex 1) defines the objectives, organizational structure and operating procedures of the Fund. As an autonomous statutory authority it would have its own operational procedures. It would be in a position to enter into contract with any party including HMG. In order to address the institutional issues raised earlier the draft RWSS Fund Act would contain provisions which will enable the Fund to:

(a) preserve its functional autonomy by reducing political influence in its management;

(b) pay competitive salaries and recruit qualified professional staff to enhance efficiency;

(c) have its own financial procedures for timely release of funds to local communities and SOs;

(d) enter into contract with SOs selected according to established eligibility criteria (chapter IX) for implementation of community-based RWSS projects; and

(e) adopt and ensure procurement procedures that are flexible and efficient to execute rural water supply and sanitation services.

3.6 The draft Act would be presented to Parliament in the winter session (February, 1994). Assuming Parliamentary approval and ratification by His Majesty the King, the Fund would be established by July 1994.

E. Relationship of the Fund with Government Agencies

3.7 The basic policy guidelines for the Fund's relationship with government agencies would be through its mandate and objectives as specified in the RWSS Act. The Fund would assist government agencies to redefine their roles as facilitators in support of community-based, demand-driven approaches. The ability of the Fund, as a separate legal entity, to selectively develop relationships as needed to enhance Project performance would enable it to catalyze a number of collaborative institutional arrangements. Potential collaborating agencies include the Ministry of Housing and Physical Planning (MHPP), Ministry of Health (MOH), Ministry of Education and Culture (MOEC), Ministry of Local Development (MLD), Department of Water Supply and Sewerage (DWSS) and local government bodies.

1. Fund's Relationship with MHPP

3.8 The Fund's relationship with MHPP would focus on developing a favorable policy framework for implementing community-based RWSS services. MHPP would help the Fund by including policy provisions which encourage local self-provision, private sector involvement including NGOs, and involvement of decentralized local bodies in RWSSP. MHPP in cooperation with the Fund, could assist in developing overall monitoring systems and human resource development initiatives which strengthen RWSSP as well as other RWSS efforts, and help redefine central government role as a facilitator.

2. Fund's Relationship with MOH

3.9 The Fund may collaborate with the Public Health Division/MOH to develop training materials for hygiene and sanitation education. At the District Public Health Office (DPHO) level village health workers (VHWs) and community health volunteers (CHVs) can be utilized and strengthened by RWSSP partner SOs.

3. Fund's Relationship with MOEC

3.10 The Fund could acquire NFE materials from MOEC and store them for use by SA/SOs, or make other suitable procurement arrangements. Government NFE facilitators could also be engaged where NGO facilitators may not be available.

4. Fund's Relationship with DWSS

3.11 The Fund's relationship with DWSS would focus on making use of available resources for technical backstopping to SOs on the latter's request. DWSS could introduce a policy of facilitating DWSO staff to provide necessary technical support to SOs and local communities for implementation repair and maintenance of schemes on request.

5. **Fund's Relationship with DDCs**

3.12 The Fund would have a direct relationship with District Development Committees (DDCs) as potential informants and resources on request of SOs at the district level. In some cases, they may also serve as SAs or refer Village Development Committees (VDCs) who can serve in that role. Since DDCs are given the role of a coordinator for district development activities they have a positive role to play. DDCs would be informed about schemes being implemented by SOs. The DDC can include SO implemented schemes in the district plan to enable it to receive technical support from the District Water Supply Offices (DWSOs). It may also facilitate resolution of conflicts regarding use and distribution of water resources at the community level.

6. **Fund's Relationship with VDCs**

3.13 VDCs have only been recently elected. VDCs can play the role of an ombudsman. They need to gain experience before they are technically able to carry out their mandates. Personnel management are often poor and staff incentives are generally la[illegible]ng. VDCs have minimal resources with which to carry out RWSS activities. In this context VDCs could carry out pilot projects with technical assistance from SO/SAs. VDCs can also help to resolve water source disputes through mediation.

F. Fund's Relationship with Nongovernmental Organizations

3.14 The Fund's relationship with nongovernmental organizations (NGOs), and other SO/SAs, would be governed by the RWSS Act, rules, sub-rules and contractual agreements. Relations with NGOs would be contractual and binding, and funding will be provided on a staged payment basis (Annex 4).

3.15 The Fund's relationship with SAs would primarily be contractual. The Fund would contract SAs for promotional activities, training of potential SOs, site appraisal, monitoring and evaluation, research and development, auditing of the Fund's account and pro[illegible]n of goods and services.

3.16 The Fund would have direct relationships with participating communities through their water user committees (WUCs). A tripartite agreement between the Fund, SO and WUC and transparent agreements between the SO and WUC would define the relationship between communities, Fund and the SO. To ensure financial transparency SOs would be required to maintain books of account, submit financial statements, make periodic reports and have the accounts audited. Through such agreements between the Fund, SO and WUC, communities would play a leading role in planning, implementing and operation and maintenance of RWSS schemes.

G. Organization

1. **Board**

3.17 The Fund would be governed by a management Board constituted by HMG/Nepal. The composition of the Board, as defined in the RWSS Fund Act

(Annex 1) would ensure cross-sectoral representation and expertise to carry out its functions effectively.

3.18 The Board would consist of seven members of which at least one will be a woman. Four members, one each from MOF, MHPP, MLD and NPC would represent the government and the remaining three would represent the private sector including nongovernmental organizations. Board members would meet qualifications defined in the RWSS Fund Act (Annex 1). Board members from the private sector would include at least one member with expertise in the following areas: participatory approaches to development, hygiene and sanitation education, and rural water supply and sanitation engineering. The chairperson of the Board would be elected by Board members. The Board would be accountable to HMG and could be dissolved by HMG at any time it fails to carry out its mandate as defined in the RWSS Act, rules and sub-rules.

3.19 The Board's functions would be related to policy making and is prohibited by the RWSS Fund Act from becoming involved in day to day operations of the Fund. The Board would be responsible for overall Fund policy and monitoring its implementation. All necessary powers of approving the budget, program and plans of the Fund and approving SO eligibility and sub-projects have been conferred to the Board. The Act would enable the Board to delegate authority to form sub-committees for any specific task. The specific powers and functions of the Board would be to:

(a) formulate, approve and monitor policy decisions on any matter concerning administration of the Fund;

(b) monitor the present and approve the future program of the Fund;

(c) review and approve annual budget of the Fund;

(d) appoint an independent auditor to carry out annual financial audit of the Fund;

(e) appoint an independent consultancy firm to undertake technical audit of Fund operations;

(f) make necessary recommendations to His Majesty's Government for the rules to be promulgated under the RWSS Fund Act;

(g) establish sub-rules for Fund operations;

(h) approve operation plan of the Fund;

(i) approve eligibility criteria for selection of support organizations;

(j) approve funding of sub-projects; and

(k) appoint and dismiss the Chief Executive Director.

2. <u>Secretariat</u>

3.20 The secretariat would initially be composed of a small cadre of 7 competent professional staff and 11 support staff. All staff would be recruited on contract through open competition. The executive staff would consist of the Chief Executive Director (CED), financial analyst, rural sociologist or anthropologist, RWSS engineer, M&E specialist, procurement specialist and training specialist. In addition a long term Technical Advisor (TA) would be recruited for a 3 year period to assist the CED in managing the Fund's program. The 11 support staff would consist of 1 office manager, 2 secretaries, 1 sub-accountant, 3 drivers, 2 runners and 2 watchmen. The Board's policies would be executed by the secretariat (see Organization Structure, Figure 3.1) whose responsibility would be to facilitate and ensure that all the Fund's objectives are achieved.

3.21 Chief Executive Director. The secretariat would be headed by the Chief Executive Director (CED) who would be appointed by the Board for four years through open competition. The CED would not hold any political party office. Key qualifications of the CED requires that she/he be a graduate degree holder in social sciences or management or engineering with formal training in management and/or social sciences (see RWSS Fund Act, Annex 1). The CED would be the ex-officio secretary of the Board and is the key link between policy making and execution. The CED would have full autonomy to manage its personnel. She/he is accountable to the Board for overall performance of the Fund. His/her specific tasks are to:

(a) carry out day-to-day administration of the Fund;

(b) implement the policy decisions of the Board;

(c) reccmmend staff appointment and dismissal to the Board;

(d) make job allocations for employees and evaluate their performance;

(e) provide incentives and take disciplinary actions against employees;

(f) chair the Technical Appraisal Committee that would select and send for Board approval the SO/SAs and sub-project proposals that meet established eligibility criteria.

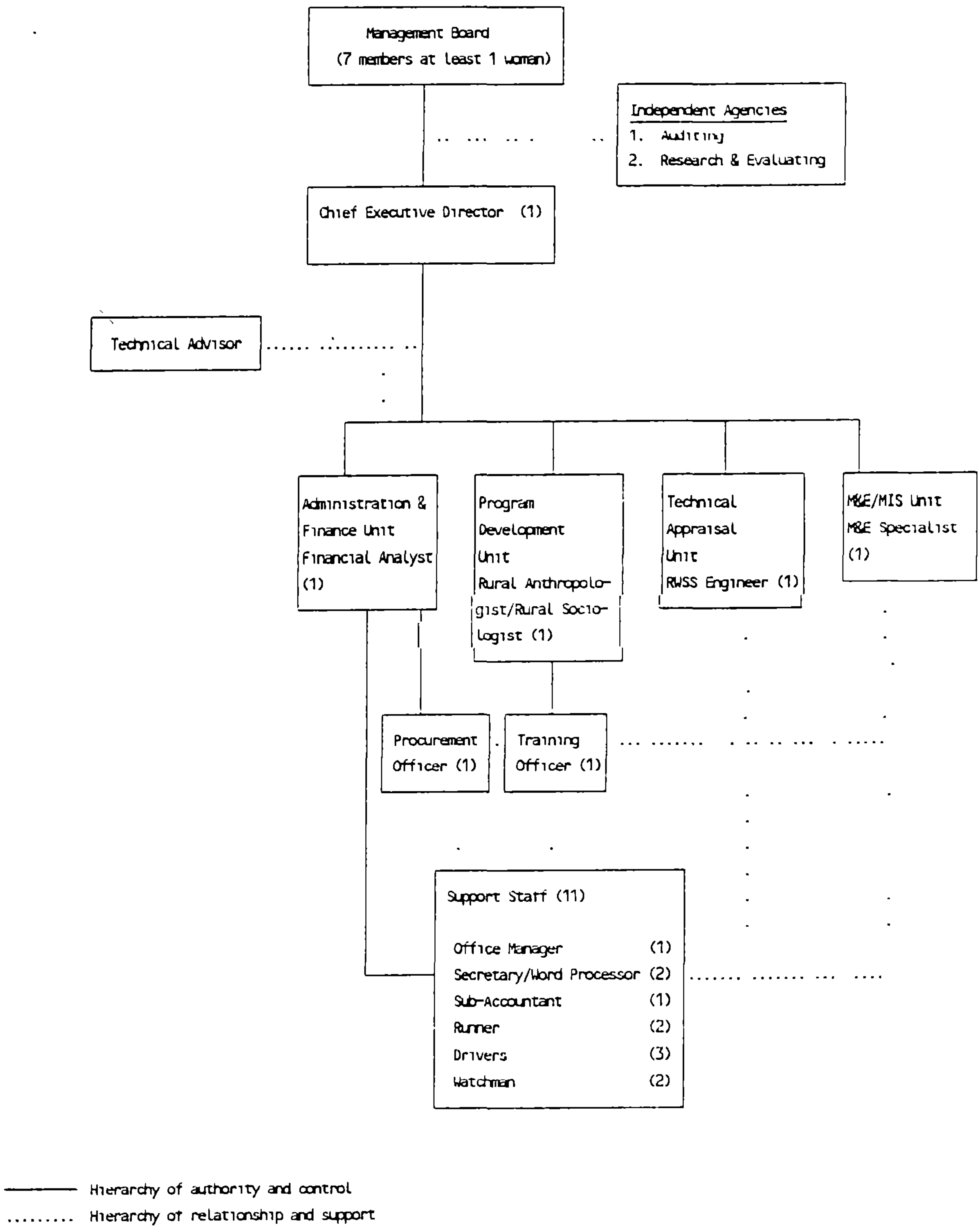
3.22 Technical Advisor. A long term technical advisor would be recruited for a 3 year period (with expertise and experience in all software, technical and management aspects of the Fund's work) and several months of short term technical assistance would be made available to assist the CED in managing the Fund's work program. The Technical Advisor (TA) would help the Fund in institutional development, project management, financial management, strengthening M&E and engineering design. The TA would be directly responsible to the CED. The overall responsibilities of the TA are described in the draft TOR (Annex 23).

3.23 Executive Staff. The executive staff would head the 4 units within the secretariat and would be responsible for their respective jobs. For detail job descriptions (See Annex 3: schedule D). The four units are:

(a) Administration and Finance Unit;

(b) Program Development Unit;

Figure 3:1 Organizational Structure of RWSS Fund



(c) Technical Appraisal Unit; and

(d) Monitoring and Evaluation Unit.

In addition there would be a Training Officer within the Program Development Unit and a Procurement Officer within the Administration and Finance Unit.

3.24 Administration and Finance Unit. This unit would be staffed with a Financial Analyst and a Procurement Officer. The unit would be responsible for program budgeting, accounting, disbursement of funds to SOs and SAs, arrangement for logistical support, updating personnel records and performing other administrative work. This unit would procure contracts for necessary goods and services for the Fund and is also responsible for maintaining standards and norms of unit prices for all goods and services. The Procurement Officer would work within the Administration and Finance Unit and would also coordinate with other units regarding contract services.

3.25 Program Development Unit. This unit would be staffed with a Rural Sociologist/Development Anthropologist and a training officer. This unit would be primarily responsible for providing guidelines and specifications for software components to be undertaken during sub-project cycle, preliminary appraisal of software activities proposed by SOs, processing of sub-projects on the basis of eligibility criteria, and assessing technical capabilities of SOs to undertake proposed software activities. This unit would also make training needs assessment, appraise potential SAs for training and other services.

3.26 Technical Appraisal Unit. This unit would be staffed with a Sanitary Engineer with adequate experience in community-based approaches. It would be responsible for providing technical guidelines and specifications for hardware components of schemes (see chapter IV for details), preliminary appraisal of hardware components and assessment of SO technical capability. Technical appraisal of schemes would normally be contracted to SAs.

3.27 Monitoring and Evaluation Unit. This unit would be staffed with a M&E Specialist. It would be responsible for developing M&E indicators, developing indicators for impact assessment of the Project and maintaining adequate data base for evaluating Fund performance. Monitoring and evaluation of sub-projects would normally be contracted to SAs. In some cases the unit would also monitor schemes.

3.28 Support Staff. There would be 11 support staff including logistical support. The CED would supervise all support staff and provide their job descriptions.

H. Cost of RWSS Fund

3.29 The total cost of the RWSS Fund would be US$ 4557.48 thousand of which capital cost would be US$ 402.78 thousand, recurrent costs would be US$ 2185.19 thousand (Annex Table 2) and institutional development cost would be US$ 1969.51 thousand (Annex Table 6).

1. Capital costs (US$ 402.78 thousand)

3.30 Capital cost of the Fund includes vehicles, computer and other equipments, furniture & fixtures and other assets (Table 3.1). Capital assets would be financed by IDA credit as foreign cost component. Capital assets would be replaced in the fourth year. The vehicles would be used to pick up Fund staff and used during field trips. All vehicles would stay in the Fund office compound. Detail cost breakdowns of capital assets is provided in Annex Table 6.

Table 3.1: Capital Cost of the RWSS Fund

	units	US$ '000	US$ '000
Capital cost			402.78
Vehicles			231.84
Long 4WD	2	145.15	
Short 4WD	2	40.95	
Sedan Car	2	37.50	
Motor cycle	4	8.24	
Computers & Other Equipments			141.03
200 MB	14	65.30	
Computer Software	2	3.81	
Net Working Board	14	15.40	
UPS	14	3.65	
Laser printer	2	6.27	
DOT Matrix Printer	14	6.27	
Plotter	2	5.23	
Photocopy Machine	2	8.82	
Generator	2	13.28	
Audio Visual Eqp.	1	8.88	
Fax Machine	2	4.12	
Furniture and fixtures			8.33
Desks		2.66	
Chairs		2.22	
Sofa sets		0.67	
Filing cabinets		2.78	
Other assets:			21.58
Bicycle		0.31	
Electric fans		1.03	
Kerosene heaters		0.30	
Calculators		0.23	
Emergency lights		0.12	
Asset purchase provision		19.59	

Source: Consultant's Estimate.

2. **Recurrent Costs (US$ 2185.19 thousand).**

3.31 Recurrent cost includes staff salaries, travel allowances, office operating expenses, repairs and maintenance, miscellaneous expenses, pre-development site appraisal, water quality testing and monitoring and supervision (Table 3.2). The Fund would recruit a small cadre of experienced and highly motivated professionals. Salaries of Fund staff would reflect true staff costs and would commensurate with qualification and experience. The proposed salary scale reflects the sa[illegible] structure of the private sector. Overstaffing and an unattractive salary structure is a major problem of government agencies leading to inefficiency, mismanagement and corruption. Optimum staffing, good salary incentives, clear job descriptions, effective monitoring, and a reward system based on performance are key issues in effective service delivery.

3.32 For immediate Fund establishment acquisition of land and construction of office building would not be feasible. An office space would be rented and would be furnished and equipped according to its needs.

Table 3.2: Recurrent Cost of the RWSS Fund

	US$ `000	US$ `000
Recurrent costs		2185.19
Staff salaries		603.38
Executive Staffs(5)	369.19	
Support staff (6)	213.88	
Logistic support staff (7)	20.31	
Travel Allowance		28.89
Daily allowance	24.68	
Travel allowance	4.21	
Office Operating Expenses		364.55
Office rent	94.01	
Water & electricity	[illegible]	
Insurances	[illegible].70	
Printing and stationary	38.78	
Telex, fax & telephone	78.73	
Legal expenses	4.70	
Fuel expenses	62.54	
Board meeting costs	54.06	
Postage	4.70	
Bank charges	4.70	
Repair & maintenance		51.44
Computer	10.31	
Vehicle	23.50	
Other assets	17.63	
Miscellaneous Expenses		58.76
Pre-development Site Appraisal		179.92
Water Quality Test		87.10
Monitoring & Supervision of Sub-projects		811.15

Source: Consultant's Estimate.

3.33 Site appraisal of schemes to verify source adequacy, design standards and water quality testing etc. would be contracted to qualified SAs. Similarly process monitoring and supervision would be contracted to qualified research firms. A detail breakdown of total recurrent cost is provided in Annex Table 6.

3. Institutional Development ($1969.51 thousand).

3.34 Institutional development cost would include: (a) promotional activities of the Fund, training of Fund staff and Board members, and M&E activities of the Fund; (b) training of SOs/SAs staff; and (c) materials adaptation and development (Table 3.3). A detail breakdown of institutional development cost of the Fund is provided in Annex Table 6.

3.35 Fund promotional activities such as publicity and dissemination of information would be done through SOs and SAs, district organizations and through mass/print media (radio, T.V. and booklets).

3.36 Development of information, education and communication (IEC) materials would be contracted to firms involved in social marketing. Similarly monitoring and evaluation and impact evaluation of the Project including evaluation of Fund performance would be contracted to qualified SAs.

3.37 The Fund would have services of a technical advisor for three years and other short term advisors to strengthen institutional capacity. Independent financial and technical audit and evaluation would be contracted to professional audit firms and technical institutions respectively.

3.38 Services of training institutions/consultants would be solicited for training and orientation of SOs. Training support for SOs would include M&E training, financial management training, technical training, CF training, HF training and M&E follow up training (Annex Tables 22-26).

I. Operating Procedures

3.39 Operating procedures would guide day to day functions of the Fund. Its autonomy and flexibility would be ensured by giving it the power to make its own administrative, financial and technical procedures through rules and sub-rules.

1. Administrative

3.40 Administrative procedures would deal with decision-making processes, delegation of authority, administrative matters and personnel policies of the Fund. The basic administrative procedure for the Fund would consist of: (a) making policy decisions by the Board; and (b) execution of policy decisions by CED in co-ordination with other executive staff.

Table 3.3: Institutional Development Cost of the RWSS Fund

	US$ `000	US$ `000
Institutional Development Cost		1969.51
Promotion, training and M&E		1667.11
Training for Fund staff	211.69	
M&E	160.60	
Impact Evaluation	225.45	
Technical assistance	563.76	
Ind. Audit & Evaluation	502.73	
Publicity & Information	63.28	
SO/SAs training		262.90
SOs orientation	40.96	
Annual SOs & Fund exchange program	9.26	
M&E training	9.96	
Management dev. training	4.90	
Financial mgt. training	5.62	
Technical training on survey design	33.33	
Technical training on construction & supervision	16.67	
CFs training	56.72	
HFs training	74.93	
M&E follow up training	10.55	
Materials adaptation and development		39.50

Source: Consultant's Estimate.

3.41 Policy level decisions are taken by the Board while all operational decisions would be made by the CED and the executive staff. Policy decisions of the Board would be taken in concurrence by at least four members. A Board member would not sit or vote in a Board meeting if it is discussing an issue directly concerning him/her or an organization in which she/he is a stakeholder as a member or as an employee. This policy would avoid any conflict of interest.

3.42 Execution of policy decisions would be carried out by the CED. Each staff would have clear responsibilities and well defined job descriptions at the beginning of each fiscal year (Annex 3: schedule D). The CED would be the link between policy and execution in accordance with the RWSS Fund Act, rules and sub-rules. She/he would recommend to the Board the appointment and dismissal of executive staff and take disciplinary action against any employee for incompetence, negligence or misappropriation of funds. Each unit within the Fund secretariat would be accountable for its responsibilities. Staff performance would be monitored regularly and rewarded through an appropriate incentive system. Regular staff meetings would be held to review programs and progress to ensure coordination and staff input in all operational decisions.

2. Financial

3.43 The Ministry of Finance (MOF) would negotiate with bilateral and multilateral donors for securing financial resources for the RWSS Fund under favorable terms. The Fund would be independent of government budgetary system and would have its own financial procedures for fund release as defined in the RWSS Fund Act (Annex 1). Potential sources of funds to the Fund include HMG, bilateral and multilateral donors (Annex 1). For the first few years major sources of funds would be IDA credit and other bilateral grants. In the course of time the Fund with the support of MOF would channel HMG and multilateral donor funds. For the present MOF would facilitate and authorize the flow of IDA credit in the form of block grants through a special account in Nepal Rastra Bank (Figure 3.2). Eligibility criteria established by the RWSS Fund would be applied to select all projects and would follow the proposed disbursement schedule irrespective of the source of funds.

3.44 Sequencing of fund flow from IDA to local communities would consist of the following steps:

(a) There would be a credit agreement between MOF and IDA for disbursement of funds to the RWSS Fund. Disbursement of funds to SOs undertaking sub-projects in partnership with local communities would be made on the basis of eligibility criteria defined in the sub-rules of the Act;

(b) There would be a project agreement between the Fund and IDA. The agreement would define IDA obligations to transfer funds directly to the Fund special account in Nepal Rastra Bank. The Fund would submit withdrawal applications to IDA with supporting documents and annual accounts audited by an independent commercial auditor;

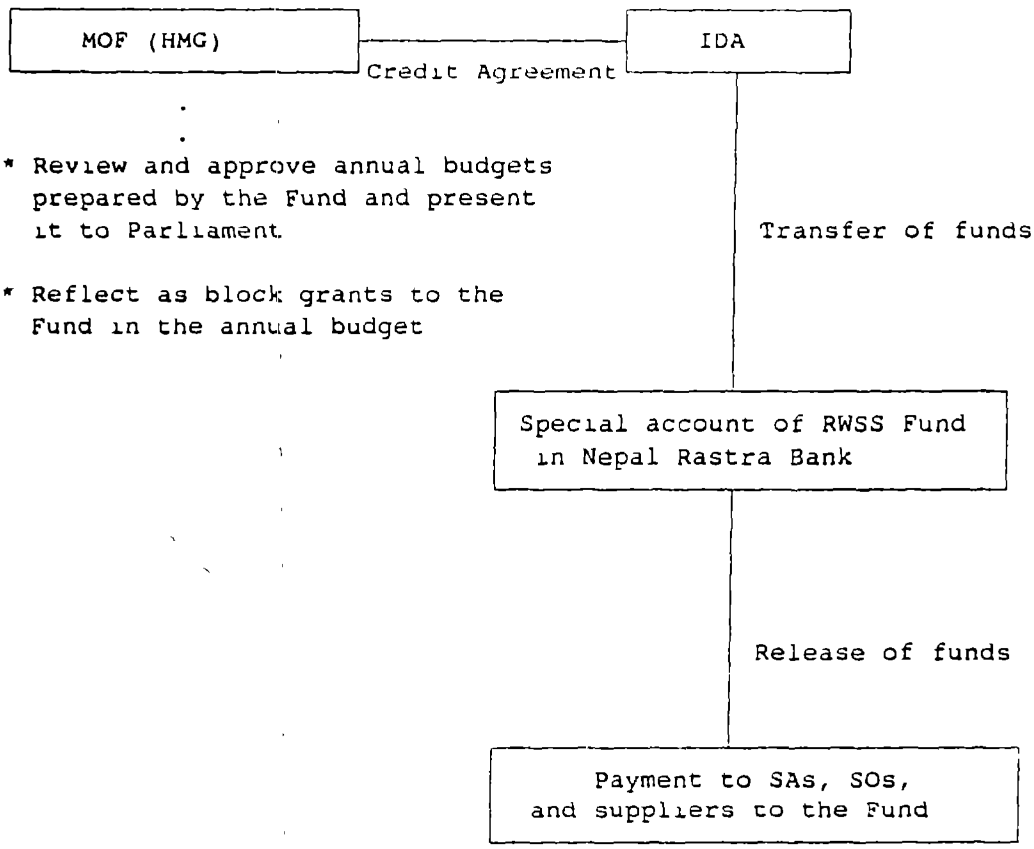
(c) There would be a subsidiary grant agreement between MOF and the Fund (Annex 26). It would include MOF obligation to facilitate the flow of IDA credit as annual block grants based on projected expenditure shown in the annual plan of the Fund. Through this agreement MOF would oblige the Fund to disburse funds for RWSS sub-projects as defined in the RWSS Fund Act, rules and sub-rules. The Fund would be exempt from HMG financial procedures (Annex 26);

(d) IDA credit which the Fund would receive through a special account each year will be reflected in the annual budget of HMG and presented to Parliament. MOF would review and approve annual work programs and budgets of the Fund. Once the Fund's budget is approved MOF would make yearly budgetary allocations to the Fund and release it as block grants.

(e) The first installment of IDA funds would be transfered to a special account of the Fund upon Project agreement between IDA and the Fund. Subsequent installments would be made on submission of withdrawal application with supporting documents; and

(f) Transfer of funds from a special account to SOs and/or SA account would be made upon approval of sub-projects by the Board. The SO would report regularly to the WUC about the financial status and expenditures incurred. This requirement would be mentioned in project agreements.

Figure 3.2: Fund flow chart



3.45 Special Account. A special account of the Fund with initial balance of US$ 0.5 million would be opened as advance for four months to expedite disbursements to meet Fund establishment costs. IDA would replenish required funds any time upon submission of statement expenditures with supporting documents. The annual audit report of an independent commercial audit firm would be an additional requirement for releasing funds in subsequent years. Disbursement of funds to SO and SAs would be guided by the Fund's annual disbursement plan approved by the Board. The special account would be jointly operated by the CED and one other executive staff authorized by the Board.

3.46 Petty Cash Account. The Fund would operate a small petty cash account for day-to-day expenses. Government contribution towards petty cash would indicate its commitment to RWSSP. A sum of Rs. 25000 (US$ 500) would be maintained and expenses incurred would be reimbursed on presentation of satisfactory supporting documents.

3.47 To prevent delays in the transfer of funds SOs would be advanced part of its contractual agreement after acceptance and approval for funding. Subsequent funds would be released on installments upon timely submission of accounts, progress reports and on achieving milestones specified in the contract. The Fund would suspend disbursement of funds if implementation is found to be unsatisfactory. To minimize delays in transfer of funds to SOs, the possibility of opening Fund accounts in regional bank branches would be investigated (if a number of SOs are clustered in one area).

3.48 Financial accountability would be secured through:

(a) financial and narrative progress reports jointly signed by SO and WUC and verified through site visits; and

(b) annual technical and financial audit of accounts.

3.49 Transparency of financial transactions is of particular concern to the community and would be ensured through:

(a) periodic reporting of expenses to the WUC ; and

(b) presenting statement of accounts on public notice boards.

3.50 Financial accountability of the Fund would be ensured through:

(a) an annual audit of the Fund by an independent commercial auditing firm in accordance with generally accepted principles of audit;

(b) an annual audit of the Fund by Auditor General's office; and

(c) the concerned authority of HMG to check the accounts of the Fund at any time.

3. **Selection Procedures**

3.51 Technical Appraisal Committee. The Technical Appraisal Committee (TAC) would consist of the CED, TA and each of the four unit chiefs. The CED would chair TAC which would screen, select and send for Board approval of SOs and sub-project proposals that meet established eligibility criteria. The unit chiefs would function as protagonists for particular SOs and sub-projects. The TAC would acquire information from potential SOs on their technical and managerial capability to undertake RWSS sub-projects through SO Assessment Form (Annex 7). The TAC would assess SO track record by visiting previous SO project sites to confirm SO capacity to undertake RWSS activities. Selected SOs would be required to attend SO orientation workshop before they proceed to undertake pre-feasibility studies (Annex 27). SOs then would submit proposals for development phase activities. TAC would review the proposal and undertake site appraisals to verify felt need, community willingness to participate and contribute, and source adequacy and reliability (see chapter IX for details on eligibility criteria) before selecting projects for development phase grants. The CED would submit sub-projects for Board approval.

3.52 Similarly TAC would review and appraise proposals for implementation and post-implementation phases according to selection criteria (chapter IX). The TAC would undertake site appraisals of schemes (at least 1-3 schemes of each sub-project) to confirm that it meets Fund criteria. Each protagonist would keep a record of project progress and ensure activities in the development, implementation and post-implementation phases are accomplished according to agreed contractual terms of reference.

J. Indicators of Fund Performance

3.53 The Fund is designed to act as a promoter and facilitator of community-based RWSS activities. The Fund would set up a mechanism to monitor and evaluate its performance to incorporate lessons learnt. Fund's M&E specialist assisted by technical advisor would be responsible for all M&E requirements.

3.54 A framework for performance monitoring and evaluation for the Fund has been developed (Annex 21). Indicators for monitoring and evaluation of Fund performance, process and performance monitoring, and impact evaluation indicators developed by JA[illegible]AS (Annex 21) are being tested and refined regularly.

Substance is ok
Presentation not good
However

This chapter needs Restructuring and [illegible]! A new structure has been prepared.

IV. WATER SUPPLY AND SANITATION SERVICES

4.1 RWSS sub-projects that meet established eligibility criteria (see chapter IX) would be implemented in the rural communities of Nepal by Support Organizations (SOs) in partnership with beneficiary communities. To ensure economies of scale, financing of a single scheme would be avoided. A cluster of 3-6 schemes is defined as a sub-project.

A. Sub-project Components

4.2 Support Organizations with technical support from Service Agencies (SAs) would be responsible for three integrated components of the RWSS sub-project. These include:

(1) community organization/mobilization;

(2) water supply and sanitation services; and

(3) hygiene and sanitation education.

4.3 An additional theme that would be integrated throughout the project is the role of women.

1. Community Organization/Mobilization

4.4 Objectives. The objectives of community organization/mobilization in water supply and sanitation are to

(a) assist the beneficiary community to form a representative water user committee (WUC) capable of managing and sustaining its water supply and sanitation services;

(b) promote optimum community involvement in all phases of project cycle, through social processes that are inclusive of women and disadvantaged members; and

(c) enable the community to select design and service level options that it would support and maintain at a cost it can afford.

4.5 Promoting Community Participation. A large proportion of government sponsored WUC tend to be unrepresentative of the community. Over 50% of WUC chairperson have used drinking water projects to strengthen their influence in the communities (Annex 6). In such cases beneficiaries have merely been involved in the physical work of implementing a water supply project. Water user committee formed with more intensive interaction with the community are more representative and allow greater participation of women.

4.6 Field experience demonstrates that it is essential to have a well organized community to promote community capacity for self-reliant cooperation. This means responsibility for making and executing decisions must gradually shift into the hands of the organized community. Many NGOs in Nepal utilize nonformal education (NFE) as an entry point for building community awareness and as a base for mobilizing women for development activities (Annex 10). The evaluative materials on the impacts of female literacy on development initiatives indicates that the most visible impacts of NFE are in the areas of increased awareness of personal hygiene and increased self confidence, and ability to work in groups.

4.7 RWSSP Support to Community Organization/Mobilization. The beneficiary community would be assisted by the SO to form a representative WUC to manage and undertake all RWSS related activities (see chapter VI Table 6.13-6.14). The SO would assist the WUC to organize the community to participate in community action planning (CAP) sessions to promote community participation and peer group learning. The SO would use the CAP tools to enable users to

(a) organize into groups to collectively assess their situation and integrate new information and skill;

(b) identify needs and to play optimal roles in decision-making;

(c) build self-confidence to manage their water supply and sanitation services;

(d) discern cause and effect relationship, make informed decisions and take responsibility for action;

4.8 Communities with weak organizational capacity would be supported with a 6 month NFE class at the rate of 25 participants per community to enhance community participation. In the hills assuming community size to be 50 households this would mean 2 NFE classes per hill community. In the terai assuming community size to be 100 households the RWSSP would support 4 NFE classes per community. NFE classes would not be supported in the implementation and post-implementation phases.

2. Water Supply and Sanitation Services

4.9 Objectives. The objectives of water supply and sanitation services are to improve the service level and bring increased health and time saving benefits to the users at a cost they can afford and maintain.

4.10 Water Supply Technology. The choice of technology for rural water supply services depends on available water source(s). In the hills the choices available are the use of existing spring points and streams and improve them on site to get health benefits, or to bring them nearer the beneficiaries through gravity piped systems to gain time savings and increased health benefits.

4.11 In the terai the choice of technology includes point sources such as shallow tubewells, deep wells or dug wells fitted with handpump. Shallow tubewells are suitable in 75% of the terai. The remaining 25% of the terai is coarse gravel or strewn with boulders. In these areas the water table is very deep hence, deep well drilling would be necessary. These are appropriate where the aquifer is situated at a depth of more than 7.5 m. However the high cost of drilling and the shortage of trained personnel to carry out the work has impeded the development of a technology suitable in these areas. Dugwells are the option in these areas.

4.12 Systems Supported by RWSSP. The RWSSP in the hills would give priority to piped gravity flow system with better water quality source such as springs and spring fed streams. A spring protection program to protect existing spring supplies from contamination would be supported in communities living in the mountains where communities are too scattered to justify for provision of piped water systems.

4.13 In the terai the RWSSP would support the construction of shallow tubewells fitted with handpumps. Where shallow tubewells are not feasible deepwell or dugwells fitted with handpumps would be supported.

4.14 Design Standards. Most agencies adopt UNICEF/MHPP (1993) design standards with some adjustments. The service level stipulates public standposts or handpumps to provide 45 lcd of water within 15 minutes (round trip) distance. The general practice is to build water schemes for a design period of 15 to 20 years.

4.15 Service Level and Design Standards for RWSSP. Design standards for RWSSP would follow guidelines provided in Annex 15-17. Studies show water consumption for household maintenance, personal hygiene and sanitation to be 25-30 lcd (AIIHP, 1992; HELVETAS 1990). Water for livestock is also hauled from the drinking water source which is not accounted for in household consumption of water. Assuming that water would continue to be hauled from improved services for livestock the RWSSP would consider a demand of 45 lcd. The standard service of 45 lcd makes provision for 10% leakage, 10% wastage and provision for two buffaloes per household (60 liters/day), in addition to water demand for household maintenance, personal hygiene and sanitation.

4.16 If the water source is not adequate the minimum acceptable would be 25 lcd to avoid tapping more distant sources with higher cost implications. In this case no provision is made for domestic animals.

4.17 In the hills it takes 30-40 minutes per round trip for fetching water. In order to realize the economic benefit of time saved water supply would need to be brought within 10-15 minutes round trip (see chapter VII). In the hills this would mean one tapstand within 150-250 meters. In the terai congestion time more than distance would be a factor to provide wells within 150-250 m radial distance.

4.18 Tap flow rate of 0.15 lps would serve 10 households (present) at 45 lcd (see Annex 15 for details). When a tap is not able to provide for 10 households due to a scattered settlement or when a demand of 45 lcd cannot be met because of low source yield a minimum tap flow of 0.1 lps is acceptable. At a flow rate of 0.1 lps it would take 2 1/2 minutes to fill a 15 liter container which would still provide services at 15 minutes round trip. This would mean one tapstand would serve at least 5 households (present) to avoid over design (see chapter VII and Annex Table 78).

4.19 One shallow tubewell would generally be provided for 12 households (present) but not less than 8 households (see chapter VII). Deep tubewells and dugwells cost more than shallow tubewells. Hence, one deep tubewell or a dug well would serve a minimum 20 households (present).

4.20 Specification of Materials for RWSSP. High density polythene pipes are recommended for gravity flow systems. G.I. pipes would be used only for river or gully crossings, connections with structures or valves and at the tapstands. Intakes, reservoir, collection, distribution and break pressure chambers, and tapstands would be constructed as stone masonry preferably with cement mortar and concrete. Ferrocement technology for reservoirs and other tank construction where feasible would be favored. In shallow tubewells PVC pipes are recommended for casing and G.I. pipes for top pipes. For deep tubewells G.I. pipes would be used as top pipe and as casing pipe. Specification of materials and construction work are given in Annex 16 and 17 respectively.

4.21 Sanitation Technology. Latrine technologies are not well developed in Nepal. The technology used in the hills are the single pit latrine and the ventilated improved pit (VIP) latrine. These latrines are either the direct pit or offset type. The walls are lined with stone or bamboo to prevent the walls pit from collapsing.

4.22 In the terai the single and the twin pit pour flush latrine are used. Seasonal flooding associated with the monsoon and high water levels cause the walls of the pit to collapse. To prevent caving in concrete or brick lining is necessary. The superstructure is of bamboo, wooden, masonry, or brick depending upon the availability of local materials and community choice.

4.23 Pit latrines can pollute shallow groundwater, but if they are properly constructed they would not normally pose any environmental hazards. The contents of pit latrines can also present a health hazard if they are emptied before allowing sufficient time for it to compost.

4.24 RWSSP Support to Sanitation. The RWSSP would support two sub-components within the sanitation component. These include (a) financing of 2 demonstration pit latrines per scheme (hill), and twin pit pour flush latrines with 6 concrete rings (terai); and (b) assistance for latrine construction in the form of a sanitation fund for lending to community members.

3. Hygiene and Sanitation Education

4.25 Objectives. The objectives of hygiene and sanitation education are to

(a) improve the health and quality of life of the people by reducing the incidence of excreta and water related diseases;

(b) change people's behavior regarding personal hygiene and environmental sanitation; and

(c) improve the quality of the environment by paying more attention to latrines, sullage and waste water disposal in individual households, schools and health centers.

4.26 HSE in Water Supply Projects. The potential health benefits of improved water supplies have not been realized with mere provision of improved facilities. This failure is largely attributed to the following factors:

(a) water from the improved system is contaminated between water collection and ingestion through unsanitary water handling and storage practices;

(b) when systems breakdown women frequently revert to collecting water from polluted sources rather than contributing to the cost of repairs;

(c) old contaminated sources continue to be used for reasons of preference in terms of taste;

(d) waste water disposal methods are not improved leading to pondage which create an ideal place for disease vectors;

(e) water though made more accessible is not effectively used in personal hygiene; and

(f) the assumption that a recommendation by a health worker, accompanied by an explanation is enough to persuade people to modify their practices.

4.27 Hygiene and sanitation activities that run independently of the water supply project have been less effective in achieving behavioral changes and improved hygiene conditions. Experience indicates that most people do not change long standing practices as a result of receiving technical information which indicates that it is in its best interest to do so. Most research indicates that the primary motivation for constructing a latrine is privacy, convenience and/or status.

4.28 RWSSP Hygiene and Sanitation Education. In all RWSSP schemes hygiene and sanitation education will complement water supplies. It will precede the implementation phase and continue through the post-implementation phase. HSE component would include activities and training to support community members in particular women, school teachers and school children. In association with hygiene education a sanitation fund would be established to meet the sanitation needs of the community (see para 4.24).

4.29 The JGFFT has been developing participatory materials and field testing them for use in the RWSS Project. A kit which is adapted specifically to the CAP process has been adapted to the RWSS concept, containing sets of 15 materials for involving villagers through self-investigative tools and analytic activities. After field testing the materials at JAKPAS sites over the next year, materials proving useful to the CAP process will be reprinted in sufficient quantities for new NGOs under the RWSS Fund.

B. Role of Women

4.30 Women are the water carriers and primary users of domestic water. They are responsible for collecting and storing water, and taking care of water sources and distribution points. It is the women who decide which water point to use for drinking, bathing, laundry, and animal watering given its distance, water quality, and accessibility. Women are the first to notice a decrease in water quantity and quality as they are the most affected by it, e.g. they need more time to collect water or their children are ill more often. Women more than men have a vested interest to maintain the system. Dependency on men for whom the repair might be less urgent can be very frustrating for women.

4.31 Women are the primary caretakers of family hygiene and sanitation particularly of the young, therefore focusing educational activities on them would be more effective to achieve RWSSP objectives.

4.32 Constraints to Women's Participation. Women's participation in water supply and sanitation activities is limited by socio-cultural and economic constraints. Major constraint to women's participation in water supply activities are high demand on women's time for household and farm activities, their lack of education, status, and market opportunities, and limited access to and control over resources (Annex 22). Women do not see it as an issue that they are not in the WUC as long as they have adequate water supply nearby. Men on the other hand, do not feel there is a need to involve women in the WUC, although they support the organization of separate women's groups for health and hygiene activities.

4.33 Women often cannot get the information they need to make informed choices about the relative costs of alternative design and service level because often there are only male technicians, and male technicians tend to focus on men as the target group.

4.34 Institutionalizing the inclusion of women in project planning and implementation has been difficult, although one or two token women representatives on WUC is now the norm. Despite constraints women must be involved in rural water supply and sanitation projects if it is to attain any measure of success. In some cases this means challenging women's traditional roles in the community and trying to encourage broader participation.

4.35 Women's Involvement in Water Supply Projects. Current practices bring women into the picture only after tapstand location have been decided upon. This practice undermines the role of women in project planning and does little to enhance women's status in the eyes of the community. In the Women Involvement Program (WIP) of HELVETAS and UNICEF men and women are involved in the project on a responsibility sharing basis. Discussions with the staff of key implementing agencies indicate that a selection of one third women for WUC is more realistic than one-half women (Annex 22). In hill communities where there is little separation between the domestic and public spheres of activity women's role in decision-making is acceptable. In such communities women are more likely to play a major role in RWSS sub-projects than in the terai where women's activities are limited to the domestic sphere.

4.36 The Role of Women in RWSSP. The role of women would be promoted in RWSSP to

(a) ensure that the benefits of women's knowledge and capabilities are made use of in project design;

(b) improve women's decision making role in activities that directly affect them;

(c) ensure that the design of water and sanitation facility selected are acceptable and suitable for women; and

(d) ensure optimal and hygienic use of improved supplies.

4.37 The leading role of women in water collection and hygiene and sanitation would be reflected in all RWSS schemes by appropriate choice of women in the WUC. The Community Facilitator (CF) would assist the community define the roles and responsibilities of WUC members to help the community choose the right candidates. At least one-third members of the WUC would be women (see para 4.35 and Annex 22). The support of the WUC is essential to enhance women's participation in project design. Without this support promoting women's participation would simply not be available.

4.38 RWSSP Support Services to Women. The RWSSP would target NFE and HSE to women to raise their level of awareness, and increase women's self-confidence and ability to work in groups. In addition to training in HSE the RWSSP would support 5 women from each scheme to visit other RWSSP sites where similar projects are being undertaken. As a special technical support service to women the RWSSP would fund a skill enhancement training to help women develop additional skills required to realize the benefits of improved services. In a few selected communities a specific women program would be supported first on a limited scale before wide scale implementation.

C. Sequencing of Interventions at the Community Level

4.39 The RWSS project cycle would consist of four phases: pre-development, development, implementation and post-implementation (Figures 4.1-4.3). At the community level each cycle would consist of 12-18 working months. It is assumed beneficiary communities would be available 6 months a year for RWSS activities because of high time demand for agricultural work. Hence, each scheme would take 2-3 years.

4.40 Promoting sustainability requires an initial investment in time and other resources. Taking sustainability and effective use of water as a guiding principle means recognizing that communities are not uniform in their needs and capacities. The type of inputs needed in any community would vary according to the community's development experience and cultural traditions.

4.41 It is expected that SO input would be highest during the development phase. Responsibility for community organization/mobilization would be shared with the WUC during implementation and post-implementation phases. The SO's role would be phased down during the post-implementation phase as the community assumes full responsibility for both its water supply scheme and its future development.

1. **Pre-development Phase** (US $56.55 thousand)

4.42 Support Organizations (SOs) that are prequalified by the Fund (see chapter IX and III for details) would after receiving orientation on the RWSSP concept undertake prefeasibility studies. Support Organizations (SOs) would be encouraged to identify schemes that are geographically clustered and that have the potential to meet the Fund criteria. Analysis of prefeasibility studies would be the basis for development phase financing.

4.43 Output. Tangible outputs would be a completed prefeasibility form (Annex 27) a proposal for development phase, and a contractual agreement between the Fund and the SO for development phase financing.

4.44 Prefeasibility. Support Organizations (SOs) would use the prefeasibility forms (Annex 27) to assess the following:

1. Needs Assessment. The SO would make an assessment of community needs and the level of demand for improved water supplies. It is assumed that where need is high, demand for water supplies would be correspondingly high and would be reflected by community willingness to participate and contribute. Need would be established in terms of time savings, water consumption and widespread use of contaminated sources (see chapter VII and IX, and Annex 27 for details).

2. Source Measurement. The SO with assistance from the community would identify all potential sources by type of source, and measure its adequacy and reliability. Poor source measurement is a major problem in rural water supplies. There is a natural tendency to over-estimate actual capacity leading to over design, lack of sufficient water at the tapstand and community vandalism. Since most intakes cannot trap all water available at the source due to seepage through the soil around the structure, the measured safe yield would be reduced by 10% to be on safe side (Annex 18).

3. Community Capacity. Informal group discussions with the local people would enable the SO to make a preliminary assessment of community capacity to undertake RWSS activities. Assessments of social cohesion, past experience in community initiatives, and attitude towards women's involvement would determine community capacity to organize (Table 4.1). The degree of conesiveness will be greater in communities comprising of a single ethnic group, not divided by caste. Profiling existing community capacity would assist the SO to determine appropriate inputs to improve capacity. For instance, past experience in cooperative experience would result in a greater degree of self-confidence and a higher level of capacity for which a different starting point would be appropriate.

Table 4.1: Community Capacity to Organize

Type	Community Characteristics
Strong	1. homogenous community 2. positive experience in cooperative action 3. flexible gender roles and relations 4. active and representative CBO 5. Community willing to participate
Moderate	1. mixed ethnic community 2. some success in cooperative action 3. hierarchical gender roles and relations 4. non-representative CBO 5. limited willingness to participate
Weak	1. very low level of organization 2. poor record with past development initiatives 3. CBO absent or inactive 4. little likelihood of willingness to participate

Source. Consultant's Assessment.

4.45 Pretesting of prefeasibility studies in the terai and the hill with 2 SOs indicates that 2 supervisory staff (software and hardware) are able to complete a prefeasibility study in 1-2 person days per tubewell scheme, and 2-4 person days per gravity flow scheme.

4.46 Cost estimates includes travel and per diem rate at NRs. 500 for 2 persons, and 10 % overhead. Cost per scheme is estimated at NRs. 2017 (Annex Table 28). The Fund would reimburse only those schemes that are selected for development phase financing to minimize the risk of investing in schemes that are not feasible.

2. <u>**Development phase**</u> (US$ 910.36 thousand)

4.47 Key objectives of the development phase are to form a representative water user committee (WUC), and to develop a proposal for implementation phase with SO assistance. The duration of the phase would be 3-6 months. Training at the community level would be supported to strengthen community ability to make informed choices. Each phase of project implementation would offer a series of integrated training exercises to increase community capacity to work effectively and develop their capabilities. A summary of the training program for beneficiary communities as it relates to the sub-project cycle is presented in Table 4.2.

4.48 <u>Output</u>. The output would be a CAP as a proposal for implementation and post-implementation phases and a contractual agreement between the WUC, the Fund and the SO for implementation and post-implementation phases.

4.49 <u>CAP Sessions for Community Organization/Mobilization</u>. The CAP process looks at the technical, health and organizational issues and is a strategy to enhance community participation in planning for the implementation and post-implementation phases. The most common source of disruptions to construction work are disputes over location of water points and membership of user committees. Such disputes have been traced to members not being actively involved in the early stages of project planning. Hence the CF would make at least one house visit to motivate all sections of the community to participate in the CAP sessions. Formation of a representative WUC would take place early in the development phase. Group discussions and CAP activities (Annex 24) would focus on:

(a) structured exercises for strengthening group formation;

(b) factors that hinder or promote sustainability.

4.50 The CAP sessions would discuss the tasks and responsibilities of the WUC to help the beneficiaries choose the right candidates. Some of the important tasks of the WUC would include:

(a) organization of community contributions in cash and labor towards capital and operation and maintenance costs;

(b) promotion of hygienic and effective use of improved supplies; and

(c) discussion on issues and communication to the community of decisions made.

Figure 4.1: PRE-DEVELOPMENT PHASE ACTIVITIES

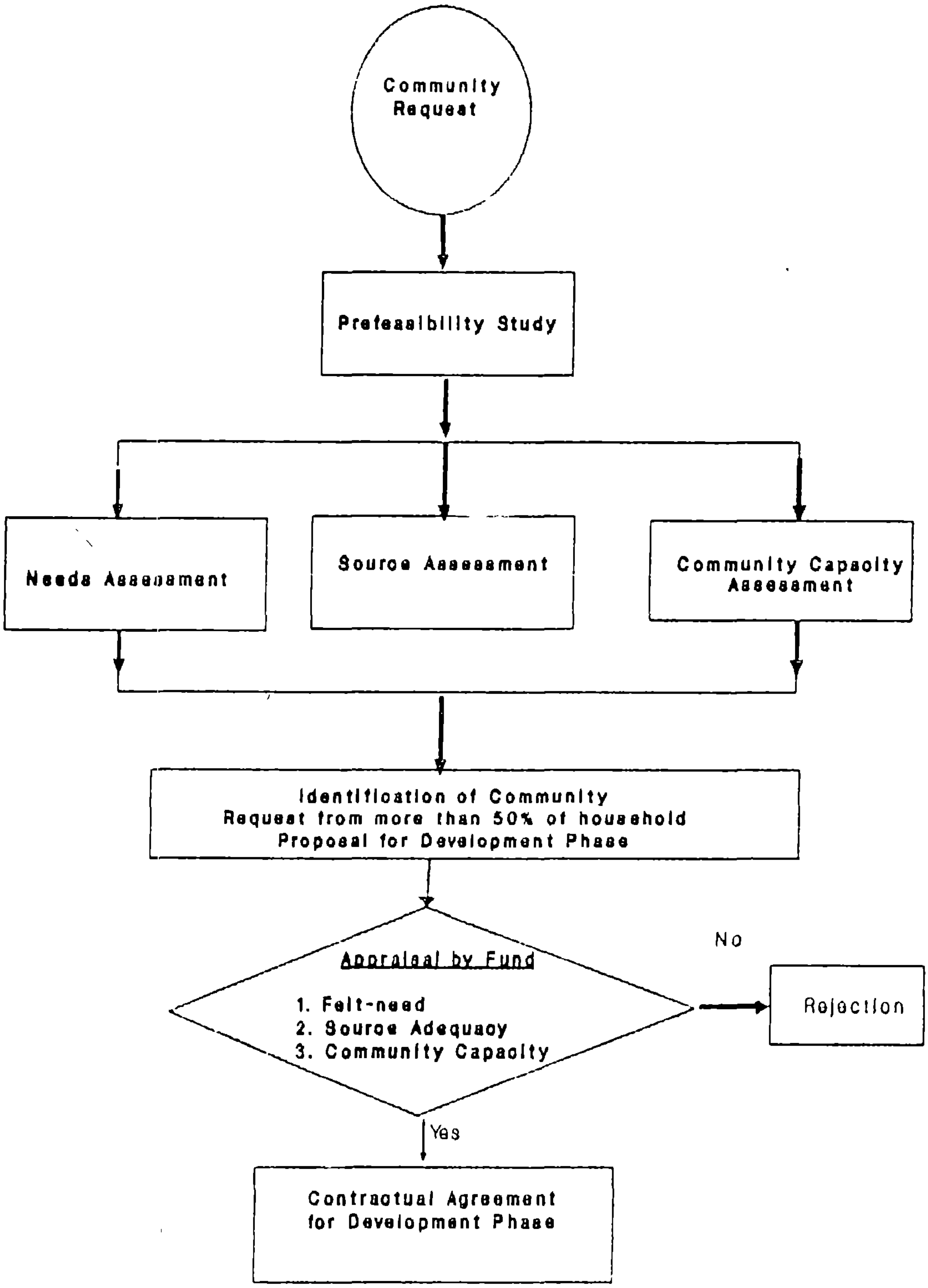


Figure 4.2: DEVELOPMENT PHASE ACTIVITIES

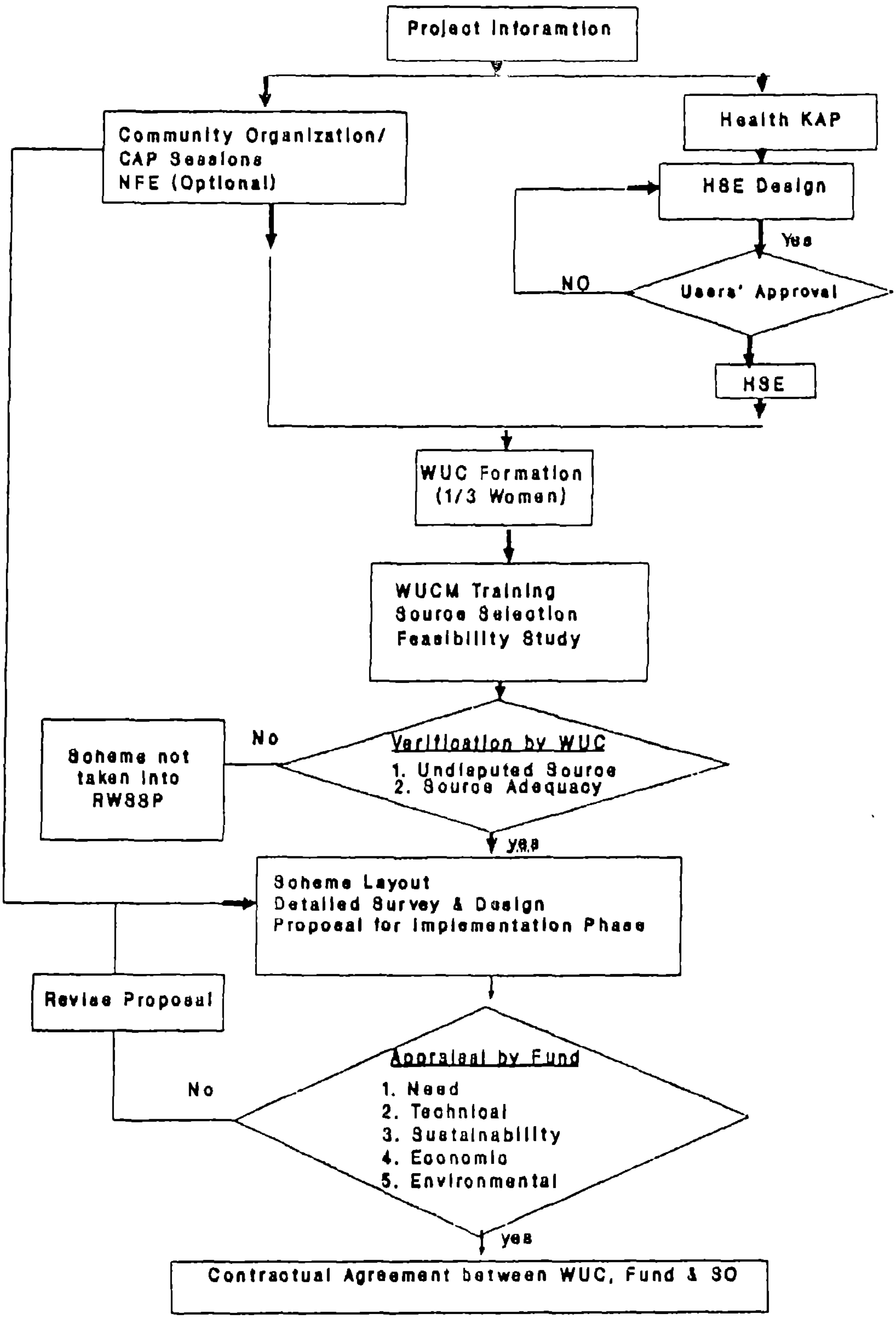


Figure 4.3: IMPLEMENTATION PHASE ACTIVITIES

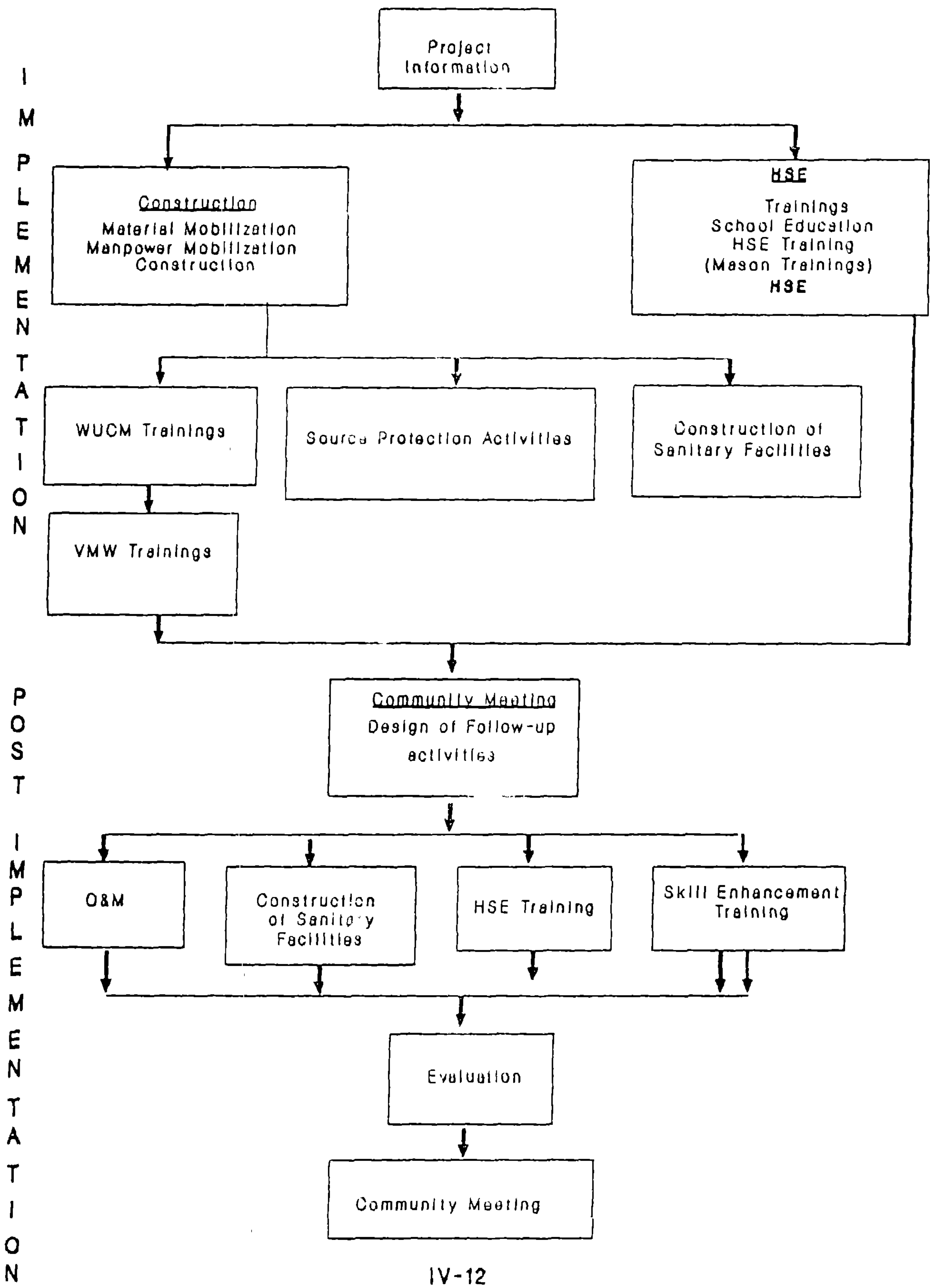


Table 4.2: Training Activities at the Community level

Training	Responsibility/Duration	Participants	Output
DEVELOPMENT PHASE			
CAP SESSIONS			Community Action Plan (CAP) for implementation & post-implementation phases
a. Community mobilization (CAP) sessions	CF & Overseer/2 hrs per session	Community members with 1/3 women	Representative WUC
b. HSE (CAP) sessions	HF or CF & WUC/2 hrs per session	Women's groups, school children	HSE strategy
c. Design/service level options (CAP) sessions	Overseer & WUC/2 hrs per session	Community members	Selection of design & service level
WUC TRAINING	Supervisory hardware & software staff/4 days	All WUC members	Increased managerial capacity of WUC
NFE (optional) and	NFE Facilitator/6 months	25 women per class	Increased self confidence ability to work in groups
IMPLEMENTATION PHASE			
HSE TRAINING	Supervisory staff/8 days	CHVs, TBAs, school teachers, HF & opinion leaders	Increased knowledge of disease transmission & HSE
HSE TRAINING	HF/7 days	Women/tapstand groups	Increased awareness of disease transmission & HSE
VMW TRAINING	Technician/on site training	2 VMWs per scheme in the hills; 1 VMW per tubewell in the terai	Trained VMW
MASON TRAINING	Technician & HF/2 days	2 local masons per scheme	Trained local masons for latrine construction
WUC TRAINING	Supervisory staff/4 days	All WUC members	Trained WUC to manage RWSS
POST-IMPLEMENTATION PHASE			
REFRESHER HSE TRAINING	Supervisory and HF/7 days	Women/tapstand groups	Increased knowledge & understanding of HSE
CROSS VISITS	HF & Technician/5 days	Local women	Increased confidence
SKILL ENHANCEMENT TRAINING FOR WOMEN	SA & CF/3 days	Local women	Increased capacity to establish linkages
SPECIFIC WOMEN PROGRAM	SA/to be determined	Selected women	

4.51 The output of group activities/discussions would be a representative WUC with at least 1/3 women (see para 4.35) and identification of the village maintenance worker (VMW).

4.52 WUC Members Training. WUC formation will be followed by a 4-day basic training of WUC members. Training would be conducted by SO supervisory software and hardware staff. They would be assisted by the CF and the technician. Training contents would include construction management skills and supervision, O&M management, financial and general management and integration of gender issues. Training would be designed to enable the WUC make informed decisions on choice of technology and service levels as they will have consequences for community contributions for capital and operation and maintenance costs.

4.53 Cost of community mobilization for the development phase is estimated at NRs. 11600 (Annex Table 32). This includes the cost of the Community Facilitator (CF) at NRs 2000/month for 3 months in the development phase and travel allowances at NRs. 500 per month. Supervision cost is estimated at a per diem rate of NRs. 600/day and travel allowance at NRs. 500 per day. WUC members from two schemes would be trained for 4 days (see para 4.52). Training costs include teaching materials, food and lodging for the trainees, travel allowance for non-resident participants, and a small overhead. The cost of the training is estimated at NRs. 11550 for 20 participants. The cost per trainee is estimated at NRs. 578 per training (Annex Table 34).

4.54 Nonformal Education. Communities with no previous experience in cooperative action and characterized as having low levels of organizational capability would require NFE classes (Table 4.1). Women's literacy in Nepal is about 25%. It is assumed that at least 25% of the communities would have the characteristics of a strong community. Hence it is anticipated that 50% of communities participating in RWSSP would require NFE classes. The NFE classes are held for 6 months, 2 hours each night. The NFE Facilitators (NF) run the classes and are supervised by the NFE Supervisor (NS). Classes would be targeted to women. The CF and the NFE Facilitator would encourage at least one woman from each household to participate in the NFE classes.

4.55 Where NFE classes are held the NS would also function as the community's HF to (a) undertake all HSE CAP sessions and (b) a health KAP study (Annex 14) with a representative sample of 30% households in each community to monitor changes in hygiene and sanitation behavior. This would enable community members in particular, women to integrate hygiene and sanitation issues into their water supply and sanitation project. The analysis would assist women to design a HSE strategy.

4.56 The NFE Facilitator would be supported for 6 months at NRs. 400.00 per month or at a rate of NRs. 20 per class. NFE Supervisor is costed for 2 months per scheme at NRs. 2000 per month. Rooms for NFE classes would be made available by the community. The cost of NFE Facilitator and NFE Supervisor including the cost of books, stationery, and supply (blackboard, lantern, chalk, kerosene) are based on average cost of organizations undertaking NFE classes (Annex Table 35). The cost of NFE for RWSSP is estimated at NRs. 8000 per NFE class.

4.57 Detailed Survey and Design. Detailed survey and design would be carried out by an engineer/overseer with CF and WUC assistance. Activities include:

(a) Resource mapping of the community which would include all information stipulated in Annex 19. In particular the resource map would show all beneficiary households, sources in use, location of all potential and proposed sources and its distance.

(b) Source selection and measurement is an important activity in which community members would be involved. The WUC and the SO would before proceeding on to the detailed survey and design confirm source adequacy and reliability and that no source disputes exist (see Annex 18). Potential and proposed source(s) would be subject to a sanitary survey to assess water quality and the potential for contamination. The cost of developing different sources and its implications on service level would be discussed.

(c) Discussions on design options and the level of service to be provided such as open or closed system, continuous or intermittent supply, number of households per tap or well, provision for drainage, laundry, bathing, troughs for animals etc. would be discussed including its associated cost and expected community contributions for capital and O&M costs. Where gravity flow scheme is not feasible or would not cover the entire community, alternative provision such as spring protection would be investigated.

(d) Topographical survey would be carried out with abney level or automatic level in order to fix the location of water supply system components. The longitudinal ground profile along the proposed pipeline alignment, contour plans of intake and sites for reservoir tank and sedimentation tank (if provided) would be prepared through surveys. Horizontal angles and distance would be measured to prepare accurate layout plan of the water scheme showing actual location of source/intake, reservoir, break pressure chambers, other pipeline chambers, standposts along with transmission mains and distribution lines. Sites for different system components would be marked with permanent bench marks and pegs would be driven along the pipe routes at all survey stations and where pipeline changes direction. Land for siting system components, number of tapstands and its location would be discussed and agreed upon by the community. The WUC and women's group would be involved in siting different components of the system. Women would be made responsible for deciding the location of tapstands or hand pumps. Scheme layout would be transposed onto the resource map to assess how each group within a community would benefit by improved supplies. The resource map would be used to ensure that all households are covered.

(e) Detailed design and estimate of the system will be carried out in accordance with established design guidelines (Annex 15). The design and cost estimate would be attached to the implementation phase proposal which would include a detailed layout plan, hydraulic profile, tapflow calculation sheet, hydraulic calculation and pipe design sheet, bill of quantities and cost estimates of each component with sketch drawings, and a summary of system design and cost (Annex 13). The layout plan would show ground elevations at each system component and pipe junctions, pipe diameter, pressure class, length and flow, safe yield of source and tapped flow, reservoir capacity, and household/population served by each tap. A community meeting will be held to discuss user acceptability of design.

4.58 For water supply system an engineer is costed for 8 days at a per diem rate of NRs 600 and travel allowan... at NRs. 500. The overseer is costed for 26 days at a per diem rate of NRs. 200 and travel allowance at NRs. 500 (see chapter VI Table 6.13 and Annex Table 73-74).

4.59 CAP Sessions for Hygiene and Sanitation Education. The Hygiene Facilitator (HF) with assis...nce from women WUC members would organize women for CAP sessions dealing with hygiene, health and sanitation. These include the use of:

(a) investigative pocket charts for assessing water usage, defecation habits;

(b) hygiene matching cards on disease transmission routes; and

(c) healthy home su... ey.

4.60 In addition to the CAP sessions the HF with assistance from women WUC members would undertake a baseline health KAP survey (Annex 14) with a representative sample of 30% households. The objectives of the health KAP are to have a deeper understanding of the meanings which community members give to the environment, health and sanitation, and to assess changes in hygiene and sanitation behavior after improved supplies. The health KAP study would be analyzed and discussed with the community. Informal group discussions with women would enable understanding of community perception of a clean environment, and water usage and sanitation practices. The HF would make at least 1 house visit in each community and conduct monthly meetings with women's groups to increase women's awareness of the role of improved supplies in reducing water-borne and water related diseases, and to enable women to integrate hygiene and sanitation issues into the community action plan for water supply and sanitation project.

4.61 The Hygiene Facilitator (HF) is costed for 2 months in the development phase at NRs. 2000 per month and travel allowances at NRs. 500 per month. Supervision cost is estimated at a per diem rate of NRs. 600/day and travel allowance at NRs. 5... per day. The estimated cost of HSE for the development phase is NRs. 10100 per scheme (Annex Table 33).

4.62 The output would be a completed health KAP and a community action plan for HSE approved by the WUC.

4.63 Community Action Plan (CAP). Discussions and CAP activities would focus in enabling users make a community action plan (CAP) as a proposal for implementation and post-implementation phases. The activities described in para 4.49-4.62 would result in a CAP consolidating HSE with water supply and sanitation services The CAP would include a detailed design, service level options considered, hygiene and sanitation education requirements, skilled and unskilled manpower requirements, trainings, source protection, environmental sanitation, M&E arrangements, cost estimates and required contribution from the community for capital and O&M costs agreed and signed by the community. Cash contribution for capital and upfront contribution for one year's O&M cost would be collected by WUC members. The SO would submit to the Fund the CAP as a proposal for implementation and post-implementation phase financing at least one month prior to completion of development phase to allow sufficient time for Fund appraisal.

3. **Implementation Phase** (US$ 10494.75 thousand)

4.64 The objective of this phase is to implement the community action plan (CAP). Major activities would include resource mobilization, construction of water supply schemes, trainings, HSE and related activities, and mitigation measures for any adverse environmental impacts due to construction, e.g. source protection, plantation of trees and provision for adequate drainage and sullage. The WUC with SO assistance would be responsible for mobilizing and supervising all construction work. Construction time required would be 4-6 months.

4.65 Tangible outputs include a functioning water supply scheme, trained WUC and village maintenance workers (VMWs), trained women's groups to bring about behavioral changes in hygiene and sanitation, latrine construction and trained masons for construction of latrines.

4.66 Construction and Supervision of Water Supply Systems. The implementation phase would start with a community meeting to mobilize material, labor and porterage. Construction would begin during the slack agricultural season. Most organizations start construction in November through June when people are not busy with agricultural activities. The WUC would be responsible for the following tasks:

(a) transporting pipes and other construction materials from the roadhead to scheme site;

(b) organizing and managing stores;

(c) collecting local materials such as stone and sand;

(d) managing unskilled labor for construction of system components;

(d) keeping minutes of expenditures and decisions taken concerning water supply schemes;

(e) organizing regular meetings and solving any problems; and

(f) supervising construction and quality control.

4.67 For construction and supervision one technician is costed for 4 months (hill) and 5 months (terai) at a salary of NRs. 3000 including travel allowance (Annex Table 73-74). The CF is costed for 2 months (hill and terai) at NRs. 2000 per month. In addition supervisory hardware and software are costed to oversee construction activities (see chapter VI Table 6.14 and Annex Table 73-74). The cost of design supervision overhead is considered 20% of the total cost. The engineer is costed for 10 days at NRs. 600 per day and travel allowance at NRs. 500. The overseer is costed for 28 days at a per diem rate of NRs. 200 and travel allowance at NRs. 500.

4.68 The assumptions and procedures for cost estimation are discussed in section D. Capital cost of RWSSP schemes would include materials (tools, equipment and transportation upto nearest roadhead), skilled labor, unskilled labor (construction and portering), local material (sand, gravel and stones), and technical assistance (design, supervision and overhead).

4.69 The cost of gravity scheme (50 households) is estimated at NRs. 347100 with per capita cost of NRs. 1157 (see section D Table 4.4 and Annex Table 47). The estimated cost of a shallow tubewell is NRs. 15300 and scheme cost (100 households, 8 wells) is NRs. 122400. The per capita cost of a shallow tubewell is NRs. 2[illegible] (Table 4.4 and Annex Table 48). The estimated cost of deep tubewell is NRs. 153000 and scheme cost (100 households, 5 wells) is NRs. 765000. The per capita cost of deep tubewell is NRs. 1275 (Table 4.4 and Annex Table 49). The cost of dugwell is estimated at NRs. 102000 and scheme cost (100 households, 5 wells) is NRs. 510000. The per capita cost of dugwell is NRs. 850 (Table 4.4 and Annex Table 50). Cost of spring protection or point source improvement is estimated at NRs. 19500 and scheme cost (50 households, 7 spring) is NRs. 136500. The per capita cost of spring protection is NRs. 455 (Table 4.4 and Annex Table 51).

4.70 <u>Catchment protection</u>. Measures to protect source(s) would be initiated through the WUC. Catchment protection would include community tree plantation on 5 ha land upstream of source. The type of trees selected for afforestation would be decided after consultation with the users as some species have been found to dry up water sources. In the hills where the source catchment area is endangered 1600 trees/hectare would be planted.

4.71 The cost per sapling including transportation is estimated at NRs. 0.72 (Rapti Development Project, 1991). A survival rate of 60% is assumed, hence additional 40% would be replanted in the second year. The cost of plantation is estimated at NRs. 8064 (Annex Table 36).

4.72 <u>VMW Training</u>. VMWs would be trained on site during construction by the technician leaving the technology in the community. In the hill 2 VMWs per scheme and in the terai 1 VMW per tubewell would be trained. She/he will be involved in all aspects of construction, such as laying and joining pipes and masonry work so that the VMW would be familiar with the entire system. Upon completion of scheme construction the VMW would be given a 2-day refresher training on operation and maintenance by the technician supervising construction activities.

4.73 In the hills the cost of VMW training is estimated at NRs. 77 per person per day, material cost at NRs. 50 per person, and running cost at 10% of the total. Cost per trainee is estimated at NRs. 253 per trainee (Annex Table 41).

4.74 In the terai the cost of VMW training is estimated at NRs. 20 per person per day, material cost at NRs. 50 per person, and other running cost at 10% of total cost. Cost of training is estimated at NRs. 83 per trainee (Annex Table 42).

4.75 <u>WUC Training</u>. Towards the end of scheme construction supervisory software and hardware SO staff with assistance from the CF and the technician would conduct a 4-day refresher training to ensure that the necessary training on technical, managerial and financial skills are available within the community. In particular, training would emphasize the importance of regular O&M.

4.76 WUC members from two schemes would be trained in each session. Training costs include teaching materials, food and lodging for the trainees, travel allowance for non-resident participants, and a small overhead. Food and lodging cost is estimated at NRs. 75 per participant per day, material cost at NRs. 150 per participant and 10% overhead. Training cost for 20 participants is estimated at NRs. 11550. Estimated cost per trainee is NRs. 578 (Annex Table 34).

4.77 HSE Training for School Teachers/Community Leaders. Community elders, school teachers, VHWs, TBAs, faith healers and the HF would be given 8-day training on HSE by SO supervisory staff. These people have the confidence of the community, therefore failure to target them can undermine HSE. The content of HSE would depend on the findings of the health KAP and HSE CAP sessions but would focus on the use of safe water, personal, domestic and environmental sanitation, communicable diseases, fecal-oral transmission of disease and ways to communicate hygiene and sanitation messages (Annex 8). In each scheme 8 participants would be selected for HSE training. Participants from 3 schemes would be combined for the training.

4.78 Cost per participant is estimated at NRs. 75 per day, materials (including de-worming medicines and chemicals for in home treatment of water) at NRs. 250 per participant, resource person at NRs. 200 per day and running cost at 10% of total. The estimated cost of the training is NRs. 1137 per participant (Annex Table 39).

4.79 HSE Training for Women's groups/tapstand groups. A 7-day HSE training would be given to women's groups and/or tapstand groups and CHVs by the HF. In gravity and spring protection systems 8 participants would be selected from each scheme. Each training would combine participants from 3 schemes. In tubewell schemes 20 participants from each scheme would be selected for HSE training.

4.80 Cost per participant is estimated at NRs. 75 per day, materials at NRs. 150 and running coat at 10% of total costs (Annex Table 37). The cost of HF is included in the cost of HSE (see para 4.86 and Annex Table 33).

4.81 Participatory Hygiene and Sanitation Education. HSE would center on changing hygiene practices relating to personal hygiene, domestic hygiene and environmental sanitation. Children's feces are more likely to contain disease pathogens than adults, hence HSE would emphasize the need to dispose children's feces safely. Target groups to focus HSE activities include women, opinion leaders and school children. Hygiene facilitators (HF) and the CF would work to build support for change among them to facilitate wide adoption of new practices.

4.82 Women/tapstand groups and CHVs would be targeted for hygiene and sanitation education. They would be involved in health KAP and CAP sessions dealing with health and sanitation issues. The CHVs' receive training on primary health care through the MOH and would be an important link for follow-up activities. Their additional training and frequent contact with the MOH's village health worker would enable women/tapstand group to get information and utilize services of other health related activities (such as immunization, etc).

4.83 Female hygiene facilitators (HF) would be recruited to bring about more healthy behavior in the community. To promote the role of women the SO would (a) discuss with local leaders the need to involve women in water supply and sanitation projects; (b) visit women individually particularly the poorest to inform them about the RWSSP to solicit their participation; and (c) organize women into small groups to discuss issues and develop their problem solving capacity.

4.84 HSE activities would be held in small groups usually 6-12 people. Small group discussions/activities would provide an opportunity for in-depth insights into women's constraints and concerns. This is an effective strategy to bring women who would not otherwise participate in formal settings. Participatory materials and other comple· ·tary techniques such as role play, stories, flip charts, etc., would be used to repeat and reinforce messages.

4.85 Women/tapstand group meetings would be held at least once a month to discuss issues in hygiene and environmental sanitation. Each meeting would be held for 1-1/2 hours and will cover one theme per session. Between meetings the HF would make house visits to motivate women and assess the impact of group discussions. The HF would also visit the local primary school to discuss HSE problems with school children.

4.86 The HF is costed for 3 months in the implementation phase at NRs. 2000 per month and travel allowance at NRs. 500. Supervision cost is estimated at a per diem rate of NRs. 600/day and travel allowance at NRs. 500 per day. Cost of HSE for the implementation phase is estimated at NRs. 13800 (Annex Table 33).

4.87 Sanitation. Appropriate low-cost technologies meeting community needs would be assessed by the technician, CF and HF (see chapter VI Table 6.13). Sanitation measures such as latrines, garbage pits, pens for domestic animals, facilities for washing and bathing, and dish drying racks that would assist in improvements of personal hygiene and environmental sanitation would be promoted.

4.88 Mason Training. At least two masons from each community would be trained in the construction of low-cost latrines. They would be given a special two days training by the technician during construction of demonstration latrines. The technician and the HF would be involved in the training.

4.89 Cost includes refreshment at NRs. 77 per person/day, material cost at NRs. 50 per person, and running cost at 10% of the total. The cost per trainee is estimated at NRs. 253.00 (Annex Table 40). Supervision cost is included in Annex Table 73-74. Hardware cost of latrines is costed separately as hardware cost.

4.90 Demonstration Latrines. In each scheme two demonstration latrines would be constructed in conjunction with hygiene and sanitation education. These will be built at places where they will have maximum visibility and impact. The two demonstration latrines would be provided to members who will promote the idea to others in the community.

4.91 Where the maximum ground water level is less than 2 m below the pit bottom, the latrine would be a minimum 10 m from the nearest drinking water source. The contents of the pit latrine would be left open for 2 years before emptying to ensure that there are no viable pathogenic organism remaining. Demonstration latrines would be carefully monitored by the technician and the HF as an improperly constructed and poorly maintained latrine would only confirm community distaste for latrines. Conversely, the success of a demonstration latrine would provide a motivating force to spread the message to a wider audience.

4.92 The cost of a single pit latrine with masonry superstructure is estimated at NRs. 4700 and for a twin pit with 6 rings it is NRs. 5500. (Table 4.3).

Table 4.3 Estimated Unit Cost of Sanitation

Technology Type	Upto Pan Level NRs.	With Superstructure (NRs.) Masonry Structure	Bamboo Structure
Ordinary Single Pit Latrine	380	4700	960
Two Pit Latrine with ring system	1115	5500	1700

Source: Consultant's Estimate

4.93 Sanitation Fund. Demand for sanitation services are not as strong as for water supplies. Cultural aversions to defecating repeatedly in one place or in a place where others have recently defecated are constraints to widespread use of sanitation facilities especially in sparsely populated areas where there is virtually no perceived need for sanitation. Conversely, demand for sanitation is likely to be high in more densely populated communities.

4.94 It is expected that demand will occur slowly in the first year and rapidly in subsequent years following a sigmoide curve. It is anticipated that there would be a 15% demand in the implementation phase, 25% in the post-implementation phase and 15% in the following years. Complete coverage would take about 6 years. It is expected that at the end of the post-implementation pnase 40-50% of households would have constructed latrines. We expect a 40% (hills) and 50% (terai) demand for assistance to build private latrines within 2 years of scheme implementation. The proposed levels of demand take into account a more focused HSE program.

4.95 The RWSSP will provide funds sufficient to construct latrines upto pan level for 25% of the total households in a revolving fund to be managed by the water user committee (WUC). The WUC will manage the fund for lending to community members. The cost of ordinary single pit latrine upto pan level is estimated at NRs. 380 and cost of twin pit latrine with concrete ring at NRs. 1115 (Table 4.3). The cost of superstructure, local materials for lining the pit including labor would be borne by the beneficiaries.

4.96 It is suggested that in the hills, households be required to pay a cash deposit of NRs.150 or 40% of the cost of a simple cement slab and pan and in the terai, households would be required to pay NRs. 300 or 30% for the cost of six rings and a slab. These amounts are less than 5% of cash income of the bottom 20% households in the hills and terai (MPHBS, 1986) and should be affordable.

4.97 The balance on the loan would be recovered by the WUC based on terms and conditions agreed by the community. Assuming that 5% cash income is affordable it will take 2 years in the hills and 3 years in the terai to pay back the loan. Against these assumptions the sanitation fund would need to revolve 5 times in 6 years before all households are covered in the community.

4. **Post-implementation Phase** (US$ 1834.96 thousand)

4.98 All the anticipated benefits of water supply and sanitation services would be realized during its operational life. Activities include an intensive hygiene and sanitation education, promotion of latrine construction, practical demonstration of routine maintenance tasks, and monitoring and evaluation changes in hygiene and sanitation behavior. Activities would continue for 4-6 months.

4.99 Output. Outputs include a fully functioning and sustainable water supply scheme, hygienic and effective use of water, registered WUC, increased linkages with other organizations, and productive utilization of time saved.

4.100 Refresher HSE Training. A one-week refresher hygiene and sanitation education would be given to women's groups and/or tapstand groups by SO supervisory staff and the HF (see para 4.79-4.81).

4.101 Cost per participant is estimated at NRs. 75 per day, materials at NRs. 150 and running cost at 10% of total costs (Annex Table 37). The cost of HF and supervision is included in the cost of HSE (Annex Table 33).

4.102 Participatory Hygiene and itation Education. A functioning water supply would provide increased opportunities for demonstrating and reinforcing hygiene and sanitation messages. The HF would take advantage of daily gatherings around the tapstands to encourage and motivate women to introduce better hygiene behavior in their families. Women's groups would be given the responsibility to ensure that there is no pollution at the water intake, distribution system, collection point and surrounding areas. Support for sanitation facilities would be promoted through the sanitation fund managed by the WUC (4.93-4.97).

4.103 The Hygiene Facilitator (HF) is costed for 3 months in the post-implementation phase at NRs. 2000 per month and travel allowances at NRs. 500 per month. Supervision cost is estimated at a per diem rate of NRs. 600/day and travel allowance at NRs. 500 per day. Cost of HSE for the post-implementation phase is estimated at NRs. 13800 (Annex Table 33).

4.104 Cross Visits. It is expected that by the end of the post-implementation phase 40-50% of households would have constructed latrines. Five women would be selected by the WUC to visit neighboring communities to share and learn from each others experiences to promote hygiene and sanitation education. The visit including travel time would be 5 days.

4.105 Cost includes a per diem rate at NRs. 100 and travel at NRs.400 per person/day, and running cost at 10% of total cost. Cost per scheme is NRs. 4950. Per capita cost is estimated at NRs. 990 (Annex Table 38).

4.106 Household Latrine Construction. The technician and CF/HF would assist the WUC to manage the sanitation fund to promote and construct household latrines. The tehnician is costed for 1 month (hill) and 1 1/2 month (terai). The CF is costed for 2 months (hill and terai).

4.107 Skill Enhancement Training for Women. A 3-day orientation would be given to women/tapstand groups to develop additional skills required to realize the benefits of improved services and to help women form linkages with programs that have a credit component. These include skill and management training. If women are eager to join a credit group efforts would be made by the SO to link women to the SFDP and PCRW programs. Both programs have credit activities and can be effective linkages for credit schemes, training and extension services in the post-implementation phase and thereafter.

4.108 The cost for 3 trainers/resource persons is estimated at NRs. 500 per day, material cost at NRs. 100 per participant, refreshments at NRs. 20 per participant and running cost at 10% of total cost. Training cost for 20 participants per scheme is estimated at NRs. 9460 (Annex Table 43).

4.109 Specific Women Program. After the 3-day training women who are interested to undertake income generating activities would be screened for additional support. Support would be in the form of additional training for specific activities identified by women. This would be carried out in a few selected communities first on a limited scale before wide scale implementation. This is being currently tested by JAKPAS. The cost of this component has not been included in the present report.

4.110 Monitoring and Evaluation. A post-implementation health KAP would be conducted. Women's groups with assistance from the HF would monitor changes in hygiene and sanitation behavior. SO staff would also monitor the frequency and purpose of WUC meetings and women's involvement (see chapter VI Table 6.14).

4.111 Operation and Maintenance. The technician would assist the VMW and women from tapstand/tubewell groups to carry out routine preventive maintenance tasks such as inspecting for leaks, replacing washer where necessary, checking that water drains properly, lubricating pumps periodically and checking that the surrounding areas are kept clean.

D. Cost Assumptions and Estimates

1. Software Cost

4.112 Software cost depends on the type, size of community and type of scheme. In the hills the per capita cost of software varies from NRs. 446 to NRs. 466 for gravity and spring protection schemes. In the terai it ranges from NRs. 245 to NRs. 282 (well schemes). Differences in per capita cost are due to variations in population, household size, and differing levels of community organization capacity. A summary of estimated per capita software cost is presented in Table 4.4.

4.113 Per capita software cost in the development phase for gravity and spring protection schemes is estimated at NRs. 93. The per capita cost for terai tubewell schemes is estimated at NRs. 47. In communities requiring NFE the per capita cost increases by NRs. 20 in the hills and by NRs. 37 in the terai (refer para 4.55-4.56).

4.114 Per capita software cost in the implementation and post implementation phases is NRs. 196 and 157 respectively for gravity and spring protection schemes. For all well schemes the per capita cost is NRs. 107 (implementation phase) and NRs. 91 (post-implementation phase).

Table 4.4: Estimated Per Capita Cost of Software Components (NRs)

	Gravity Schemes	Shallow Tubewells	Deep Tubewells	Dug Wells	Spring Protections
DEVELOPMENT PHASE					
Community Mobilization	39	20	20	20	39
Nonformal Education* (optional)	54	54	54	54	54
WUC Members Training	20	10	10	10	20
HSE	34	17	17	17	34
Sub-Total	93	47	47	47	93
IMPLEMENTATION PHASE					
Community Mobilization	34	17	17	17	34
Catchment Protection	20	-	-	-	20
HSE	120	77	77	77	120
WUC Members Training	20	10	10	10	20
Maintenance Workers Trg	2	3	2	2	2
Sub-Total	196	107	106	106	196
POST-IMPLEMENTATION PHASE					
Community Mobilization	30	15	15	15	30
Catchment Protection	8	-	-	-	8
HSE	87	60	60	60	87
Skill Development Training for women	32	16	16	16	32
Sub-Total	157	91	91	91	157
	446	245	244	244	446

Source: Consultant's Estimate.
* cost of NFE is not added in sub-total (see para 4.55-4.56)

4.115 Cost of software components for sub-projects consisting of different types of schemes and community is presented in Table 4.5.

Table 4.5: Estimated Software Cost of RWSSP Schemes[1]

Technology	Scheme Population	Cost Without NFE NRs.	Per Capita Cost without NFE NRs.	Cost With NFE NRs. Dev. Phase HSE deducted	Per Capita Cost w/NFE NRs.
Gravity Scheme	300	132229	446	138129	466
Development Phase		27450		33350	
Implementation Phase		58221		58221	
Post-Implementation Phase		46568		46568	
Shallow Tube well Scheme	600	145214	245	16714	282
Development Phase		27450		49350	
Implementation Phase		63494		63494	
Post-Implementation Phase		54270		54270	
Deep Tubewell Scheme	600	144389	244	166289	281
Development Phase		27450		49350	
Implementation Phase		63494		63494	
Post-Implementation Phase		53445		53445	
Dug Well Scheme	600	144389	244	166289	281
Development Phase		27450		49350	
Implementation Phase		63494		63494	
Post-Implementation Phase		53445		53445	
Spring Protection Scheme	300	132229	446	138129	466
Development Phase		27450		33350	
Implementation Phase		58221		58221	
Post-Implementation Phase		46568		46568	

Source: Consultant's Estimate

[1] Total software cost does not include cost of NFE. Cost of NFE would need to be added where it is being supported (see para 4.55-4.56).

2. Capital Cost

4.116 Location specific conditions such as settlement pattern, source type, yield and distance cause variation in construction costs. A community with a dispersed population would have a higher per capita cost because of the need to increase pipe length to service all beneficiaries. Distance to the source would cause variation in transmission pipe length regardless of population size. Stream intake cost more than spring intake. When more sources need to be developed, the number of intake structures and transmission pipe length would increase cost. The degree of remoteness and physical characteristics of project sites are other important factors which determine cost.

4.117 When water yield meets peak demand no storage tank is required. But when length of transmission main is long providing a storage tank would reduce cost. Also ferrocement reservoirs are cheaper than masonry structure (Annex Table 81-83). The size and number of different system components in a scheme would determine its cost. This would depend upon site conditions and community choice. Our assumptions for cost estimates are provided in Annex Tables 44-46.

4.118 Rural communities in Nepal generally consist of a cluster of settlements. A recent survey of hill districts show over 70% of communities have less than 500 population. Only 4% have a population larger than 1000 (East Consult, 1992). The FINNIDA District Development Plans also indicate that a hill community consists of 50 households (on average) generally 3 small clusters of 17 households. A gravity scheme in the hill is designed for 50 households or a present population of 300.

4.119 Communities in the ter usually consist of linked settlements with a combined population of 1000-3000. Each settlement consists of 50 households on average. A tubewell scheme is designed for 100 households (about 2 settlements) or a present population of 600.

4.120 Population growth rate in the hills is about 1.3%. Population density is also much lower than in the terai which indicates that new households tend to grow more in the periphery of the existing community. Under these conditions a design period of 15 or 20 years would not significantly affect the cost of small schemes (serving about 50 households). Hence, a design period of 20 years is adopted for RWSSP.

4.121 In the terai, a higher population growth rate (more than 3% per annum) and a higher population density indicate new households tend to expand spatially. Hence, a design period of 15 years is adopted.

4.122 Cost estimates for gravity flow (50 households) and tubewell (100 households) schemes have been built using norms for RWSSP design standards (Annex 15-17). In the hills, considering possible spatial variation pipe lengths 2.5-3.5 Km for a 7 tap scheme (average 7 households per tap) is considered. Transmission pipe length 500-1000 m and distribution pipe 2000-2500m are considered. This confirms with MITS and JAKPAS schemes.

4.123 Depths of 40 m, 35 m, and 20 m have been considered for shallow tubewell, deep tubewell and dugwell respectively. FINNIDA implemented shallow and deep tubewells and NRCS implemented dugwells also follow the same norms for well depth. Sludging method is considered for shallow tubewell scheme and percussion drilling for deep tubewell.

4.124 Quantity estimate of different system components are presented in Annex Table 60-68. Sketch drawings of different system components adopted are presented in Annex 28. The norms used for quantity estimate are presented in Annex Table 70. The norms are based on HMG norms for quantity estimate and a modified version of this norm adopted by Remote Area Basic Need Project (CARE/Nepal). This would be modified based on JAKPAS's experience with actual cost of construction. Construction cost reporting form is provided in Annex 29.

4.125 Unit cost of different materials like HDPE pipe, GI pipes, fittings, cement, reinforcement bar etc. are collected from different manufacturer and suppliers in Kathmandu. The unit cost of materials adopted by FINNIDA, CARE/Nepal were reviewed. The unit price (1993) of materials that comply with materials specified in Annex 16 are presented in Annex Table 71. Unit price of construction materials, pipes and fittings reflect prevailing market prices in Kathmandu and other major districts. This would need to be updated each year. The unit cost of different system components are presented in Annex Table 53-59.

4.126 For non-local materials transportation by truck for 200 Km is considered. Porterage 13 Km (hills) from roadhead to site and 2 Km (terai) is considered. The cost of transportation and portering is estimated using the unit price (Annex Table 71). The unit cost of trucking inconvenient materials (i.e. pipes, reinforcing bars) and trucking on graveled roads are higher. Transportation by truck at NRs. 0.003 per Kg per Km is estimated. Portering 40 kg (convenient) and 25 kg (inconvenient) materials is estimated at 13 km/day.

4.127 In the hills, local materials such as sand is assumed to be available within 2 Km and stone within 200 m of site. In the terai, it is assumed that local materials would need to be hauled by truck as well as portered. Transportation cost of sand and stone to a distance 20 Km and 40 km respectively is included. In addition portering cost for 200 m is added. Unit cost of local materials are calculated based on norms (Annex Table 70) and unit price (Annex Table 71). The unit cost of local materials are presented in Annex Table 72.

4.128 Numbers of system components are based on FINNIDA implemented small schemes (7 taps). In gravity schemes, spring or spring fed stream intake of 4m length, one collection or sedimentation tank, one interruption or break pressure or distribution tank and two sectional valves, or air valves or wash out are considered. Tools and equipment are considered at 3% of system components.

4.129 In case of spring protection, intake and a tapstand are considered. Tools and equipment are considered at 5% of system components.

4.130 Tools and equipment for shallow tubewell, deep tubewell, and dugwell are considered at 8%, 0.1%, and 0.15% respectively of system components. The Nepal No. 6 handpump is considered for shallow tubewell and INDIA MARK III pump for deep tubewells. A platform with 2 m diameter is considered.

4.131 Overhead costs are generally not available. Binnie and Partners (1990) estimated average design and supervision cost at 10% of capital cost. World Bank (1990) estimated overhead and establishment costs to be between 1.5% to 15.7%.

4.132 Data based on WaterAid projects show overhead to be around 19% of capital cost. Similarly analysis of projects undertaken by Lutheran World Service show overhead to be about 15% of capital cost. Our estimate of technical assistance based on data from different agencies is about 17% of capital cost (i.e. 20% of direct cost).

4.133 Capital cost of RWSSP schemes would include materials (tools, equipment and transportation upto nearest roadhead), skilled labor, unskilled labor (construction and portering), local material (sand, gravel and stones), and technical assistance (design, supervision and overhead). The cost estimate of typical schemes are presented in Table 4.6 and 4.7 (see Annex Tables 47-52 for details).

4.134 In gravity flow system material cost is estimated at 50%, skilled labor at 2%, unskilled labor at 31%, and technical assistance at 17% of total cost (Table 4.6 and Annex Table 52).

4.135 Material cost for shallow tubewell is estimated at 58%, skilled labor at 6%, unskilled labor at 19%. and technical assistance at 17% of total cost (Table 4.6 and Annex Table 52).

4.136 Cost data for deep tubewells (water table greater than 7.5 meters) was available only from the FINNIDA project. As much as 89% of the cost is for drilling, handpump installation, and materials, 0.5% for skilled labor, 1.5% for unskilled labor and 9% overhead (Table 4.6 and Annex Table 52).

Table 4.6: Capital Cost Components of RWSSP Schemes

Technology	Material %	Skilled Labor %	Unskilled Labor %	Over-Head %	Total %
Gravity schemes	50	2	31	17	100
Shallow Tubewells	58	6	19	17	100
Deep Tubewell	89	0 5	1 5	9	100
Dug wells	58	8	17	17	100
Spring Protection	45	4	34	17	100

Source: Consultant's Estimate.

4.137 For dugwells material cost is estimated at 58%, skilled labor at 8%, unskilled labor and overhead at 17% (Table 4.6 and Annex Table 52).

4.138 For spring protection material cost is about 45%, skilled and unskilled labor is estimated at 4% and 34% respectively and overhead at 17% (Table 4.6 and Annex Table 52).

Table 4.7: Estimated Capital Cost of RWSSP Schemes

Technology	Per Capita Cost NRs.	Present Population Per Tap/well	Cost Per Well/Tap NRs	Present Scheme Population	No of Wells/Taps	Scheme Cost NRs.
Gravity Piped System	1157	43	49586	300	7	347100
Shallow Tube well	204	75	15300	600	8	122400
Deep Tubewell	1275	120	153000	600	5	765000
Dug Well	850	120	102000	600	5	510000
Spring Protection	455	43	19500	300	7	136500

Source: Consultant's Estimate.

E. Phasing of RWSS Projects

4.139 Phasing of RWSS projects is based on assessment of absorptive capacity of SOs and likely demand of RWSS services for different technology choices i.e. gravity, well or spring protection schemes. On the basis of the assessment it is expected that one national, 4 regional, and 10 local level NGOs, 9 VDCs, and 6 CBOs or one association of CBOs would be supported by the Fund in the first year (see chapter VI Table 6.15). In the first year we expect a demand of 125 RWSS schemes.

4.140 Demand for RWSS services is more likely in the hills since fetching water is more time-consuming and arduous (hardship case) than in the terai. Even though official data on coverage of potable rural water supply in the terai and hill were about the same (42%) in 1990, actual coverage in the terai is estimated to be about 65% when large numbers of unaccounted private handpumps/tubewells are included (DDP, 1992).

4.141 In the first year of implementation assuming demand in the hills would be twice that of the terai it is anticipated that 75% of schemes would be gravity and spring protection, and 25% would be tubewell schemes. Since 25% of the terai region cannot be served with shallow tubewells (foothills where sub-strata is coarse gravel consisting of boulders) it is anticipated that 20% of terai schemes would be dugwells and deep tubewells.

4.142 As a result of an effective promotion policy of the Fund, and growth in the number and absorptive capacity of SOs it is expected that the number of schemes would increase by 50, 75, 100 in subsequent years to a total of 900 schemes serving a population of about 0.34 million (about 0.5 million design population) in 5 years time. Of this 0.20 million (0.25 million design population) would be in the hills and about 0.14 million (0.24 million design population) in the terai. Phasing of sub-projects and number of population to be served is presented in Table 4.8.

Table 4.8: Phasing of sub-projects for RWSS Project (1995-2000)

Phasing

Technology	Yr2 No of Schemes	Present Pop.	Yr3 No of Schemes	Present Pop.	Yr4 No of Schemes	Present Pop	Yr5 No of Schemes	Present Pop.	Total No of Schemes	Pop.
Gravity Schemes	89	26700	125	37500	178	53400	250	75000	642	192600
Shallow Tubewell	25	15000	36	21600	50	30000	72	43200	183	109800
Deep Tubewell	3	1800	4	2400	6	3600	8	4800	21	12600
Dug Well	3	1800	4	2400	6	3600	8	4800	21	12600
Spring Protection	5	1500	6	1800	10	3000	12	3600	33	9900
Total	125	46800	175	65700	250	93600	350	131400	900	337500

Source. Consultant's Estimate.

4.143 Estimated base cost of water supply and sanitation component of RWSS project is NRs. 491.65 million (US$ 9.83 million). The estimated software cost is NRs. 144.15 million (US$ 2.88 million) of which NRs. 34.8 million (US$0.696 million) is in the development phase and NRs. 59.16 million (US$ 1.18 million) is in implementation and NRs. 50.15 million (US$1.0 million) for post-implementation phase. Estimated hardware cost of sub-projects is NRs. 339.5 million (US$ 6.79 million) of which NRs. 317.5 million (US$ 6.35 million) is for water supply and NRs. 21.22 million (US$ 0.42 million) is for sanitation. The cost of sanitation includes NRs. 10.15 million (US$ 0.203 million) for demonstration latrines and NRs. 11.05 million (US$ 0.221 million) in the form of grant for revolving fund towards household latrine construction.

4.144 Estimated base cost of water supply and sanitation including software and support costs are presented in Table 4.9. The table provides cost breakdown by development and implementation phase for each type of scheme. The estimated per capita cost of water supply and sanitation services is about US$ 29 (present population). The per capita cost of RWSSP is about US$ 42 (present population).

Table 4.9: Estimated cost of Water Supply and Sanitation Sub-projects
(US$ in '000 ; 1995 price)

Particulars	1	2	3	4	5	6	Total
PRE-DEVELOPMENT PHASE							
Prefeasibility Studies	6.01	8.41	12.02	16 83			43 27
DEVELOPMENT PHASE							
Software	98.00	135.37	192.95	270.37			696.69
Gravity Scheme	64.68	90 76	128.97	181.13			465 53
Community Mobilization	24 61	34.56	49.21	69 12			177 49
HSE	10.71	15 04	21.42	30 09			77.27
NFE	17.16	24 02	33.94	47 67			122.79
WUC Training	12 20	17 13	24.39	34.26			87 98
Shallow Tubewells Scheme	23.26	32.95	45.76	65.89			167.86
Community Mobilization	6.91	9.95	13.82	19.91			50.59
HSE	3.01	4.33	6.02	8.67			22.02
NFE	9.92	13.73	19.07	27.46			70.17
WUC Training	3.43	4 93	6.85	9.87			25.08
Deep Tubewells Scheme	3.13	3.66	5 49	7 32			19 60
Community Mobilization	0.83	1.11	1.66	2.21			5 81
HSE	0.36	0.48	0.72	0.96			2 53
NFE	1 53	1 53	2.29	3 05			8.39
WUC Training	0.41	0 55	0 82	1.10			2 88
Dug wells Scheme	3 13	3.66	5.49	7 32			19 60
Community Mobilization	0.83	1 11	1 66	2 21			5 81
HSE	0.36	0.48	0.72	0.96			2.53
NFE	1.53	1.53	2.29	3.05			8.39
WUC Training	0.41	0 55	0.82	1.10			2.88
Spring Protection Scheme	3.81	4.35	7.25	8 70			24.10
Community Mobilization	1.38	1.66	2.77	3.32			9.12
HSE	0.60	0.72	1 20	1.44			3.97
NFE	1 14	1 14	1.91	2.29			6.48
WUC Training	0.69	0.82	1.37	1 65			4 52
Sub-Total (Development Phase)	104.01	143.78	204.97	287 19			739.95

Table 4.9: Estimated cost of Water Supply and Sanitation Sub-projects

(US$ In '000 ; 1995 price)

Particulars	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Total
IMPLEMENTATION PHASE							
Water Supply							
Hardware Cost		883 [illegible]	1233 97	1767.09	2467 93		6352.53
Gravity Scheme		709.69	996.76	1419.38	1993.52		5119.35
Shallow Tubewells Scheme		70.30	101.23	140.60	202.46		514.59
Deep Tubewells Scheme		52.72	70.30	105.45	140.60		369.07
Dug wells Scheme		35 15	46.87	70.30	93.73		246 05
Spring Protection Scheme		15.68	18 82	31 36	37.63		103 48
Catchment Protection		12.93	18 02	25.86	36 04		92.84
Gravity Scheme		12 24	17 19	24.48	34.39		88.30
Spring Protection Scheme		0.69	0.83	1.38	1 65		4 54
Sanitation							
Hardware Cost		28.20	39.52	56.40	79.00		203.12
Latrines for School and Health Post							
Gravity Scheme		19.27	27 08	38.53	54.11		138 98
Shallow Tubewells Scheme		6.33	9 12	12.67	18.24		46 35
Deep Tubewells Scheme		0.76	1 01	1 52	2.03		5 32
Dug wells Scheme		0.76	1.01	1.52	2.03		5 32
Spring Protection Scheme		1.08	1.30	2.17	2.60		7 14
Software		164.28	230.16	328.55	460 31		1183.30
Gravity Scheme		111.24	156.23	222 47	312 46		802.39
Community Mobilization		21 42	30 09	42.85	60.18		154.54
HSE		76.33	107.20	152.66	214.41		550 60
WUC Training		12 20	17 13	24.39	34.26		37 98
VMW Training		1 [illegible]	1.81	2.57	3.61		9.27
Shallow Tubewells Scheme		37 83	54 48	75 66	108.96		276.93
Community Mobilization		6.02	8.67	12.04	17.33		44.05
HSE		27.41	39.46	54 81	78.93		200 61
WUC Training		3.43	4.93	6.85	9 87		25.08
VMW Training		0.98	1.42	1.97	2.83		7.20
Deep Tubewells Scheme		4 48	5 98	8.96	11.95		31.37
Community Mobilization		0 72	0 96	1.44	1.93		5.06
HSE		3.29	4 39	6.58	8.77		23 02
WUC Training		0 41	0 55	0.82	1.10		2 88
VMW Training		0.06	0 08	0 12	0.16		0.41
Dug wells Scheme		4 48	5.98	8 96	11.95		31 37
Community Mobilization		0.72	0.96	1.44	1.93		5.06

Table 4.9: Estimated cost of Water Supply and Sanitation Sub-projects

(US$ In '000 , 1995 price)

Particulars	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Total
HSE		3.29	4 39	6.58	8.77		23.02
WUC Training		0.41	0 55	0 82	1.10		2.88
VMW Training		0.06	0.08	0.12	0.16		0.41
Spring Protection Scheme		6.25	7 50	12.50	15.00		41.24
Community Mobilization		1.20	1.44	2 41	2.89		7 94
HSE		4.29	5 15	8.58	10 29		28.30
WUC Training		0.69	0.82	1.37	1.65		4.52
VMW Training		0.07	0.09	0.14	0.17		0 48
Sub_Total (Implementation Phase)		1088.95	1521.66	2177 90	3043.28		7831 79

Table 4.9: Estimated cost of Water Supply and Sanitation Subprojects (US$ in '000 ; 1995 price)

Particulars	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Total
POST IMPLEMENTATION PHASE							
Sanitation							
Hardware Cost			30.59	43.15	61.18	86.29	221 21
Household Latrines							
Gravity Scheme			10.12	14.22	20.25	28.44	73 03
Shallow Tubewells Scheme			16.05	23 11	32 09	46.22	117 46
Deep Tubewells Scheme			1 93	2.57	3 85	5.14	13.48
Dug wells Scheme			1.93	2.57	3.85	5.14	13.48
Spring Protection Scheme			0.57	0 68	1 14	1.37	3 76
Catchment Protection			5.17	7 21	10.34	14.41	37 13
Gravity Scheme			4.90	6.88	9 79	13.75	35 32
Spring Protection Scheme			0 28	0.33	0 55	0.66	1.82
Software			139 26	195 10	278.51	390 30	1003.07
Gravity Scheme			93 88	131.86	187 77	263.72	677 23
Community Mobilization			18.88	26 52	37 76	53 03	136 18
HSE			54 94	77 16	109.88	154 32	396.30
Skill Development Training			20 07	28.18	40 13	56 37	144 75
Shallow Tubewells Scheme			32 34	46 56	64.67	93 13	236 70
Community Mobilization			5.30	7 64	10.61	15 27	38.82
HSE			21.40	30.81	42.79	61 62	156 62
Skill Development Training			5 64	8 12	11 27	16.23	41 26
Deep Tubewells Scheme			3.88	5.17	7.76	10.35	27 16
Community Mobilization			0.64	0.85	1.27	1.70	4.45
HSE			2.57	3 42	5.14	6 85	17 97
Skill Development Training			0.68	0.90	1.35	1.80	4 74
Dug wells Scheme			3.88	5.17	7 76	10 35	27.16
Community Mobilization			0.64	0 85	1.27	1.70	4 45
HSE			2 57	3.42	5.14	6.85	17 97
Skill Development Training			0.68	0.90	1 35	1.80	4 74
Spring Protection Scheme			5.27	6.33	10.55	12.66	34 81
Community Mobilization			1.06	1 27	2 12	2.55	7.00
HSE			3.09	3 70	6 17	7.41	20 37
Skill Development Training			1 13	1.35	2 26	2.71	7 44
Sub_Total(Post Implementation Phase)			175.02	245 45	350.03	490.90	1261 [illegible]
Total	104 01	1232 [illegible]	1901.65	2710.54	3393.32	490.90	9633 15

V. STUDIES AND SECTOR DEVELOPMENT

5.1 Applied research and development studies would improve information available to policy makers in designing sector policies, and to test improved methods and techniques in software as well as hardware that are cost effective. Five studies including a study to prepare follow-up projects and a sector monitoring and development have been identified to provide feedback to the RWSSP and future plan of operations (Annex 25). These include measuring impacts on health and hygiene, in-home water treatment methods, appropriate low cost water and sanitation technologies, assessment of demand for rural water supply and willingness to pay, policies to promote private sector provision of rural water supply and sanitation services and inputs, and preparation of a follow-up project. The proposed studies and sector development activities would cost US$ 1.24 million (including contingencies). Detailed cost breakdowns for the study would be provided in the Final Report.

1. Health KAP and Impact Studies (US$ 0.28 million)

5.2 There is general consensus that improved water supply and sanitation services have a role in promoting good health. There is disagreement however, on the priority that should be given to particular activities in the sector. Studies on health impacts of water and sanitation projects conclude that interventions which ensure safe excreta disposal are more important than improved water supplies. The second most important factor is increase in use of water in conjunction with changes in personal hygiene behavior and the third factor is improvements in water quality (Esrey et.al).

5.3 To date only one study has been undertaken in Nepal to measure the health impacts of water supplies and sanitation (see chapter VII for details). Reliable information on the impact of different service levels and different mix of software activities would contribute site specific data. This would enable planners in making investment decisions on how resources should be allocated between water supply, sanitation, and hygiene education activities, and levels of service to be provided.

5.4 Methodology. The study would assess the impacts of different project interventions on the health status of beneficiary populations. In particular it would determine the impact on child morbidity and mortality, the effectiveness of different degrees of sanitation promotion and training, assess hygienic attitudes and behavior necesary for health impacts to occur; and develop indicators for monitoring health impacts. Output indicators to be monitored would include nutritional status of children below 5 years of age, time savings, prevalence of water related diseases, and participation in primary health care activities. Intervening variables to be monitored include water quality, water quantity, facility usage, and hygiene behavior.

5.5 Health impact studies require intensive before/after and with/without surveys. The choice of methodology used would allow for quantitative assessment and qualitative perception of the behavioral processes in disease transmission. The cross-sectional method in conjunction with a case control method is recommended.

5.6 It is envisaged that baseline data would be established in the development phase for a selected sample of communities. Data would include the prevalence of gastrointestinal and skin diseases, nutritional status of children below 5 years of age, existing knowledge, attitude and practice of the people, household water consumption and distance to water point in addition to socio-demographic information. Benefits of water and sanitation interventions would be measured 1 year after improvements have been implemented to control for confounding variables. The results of the study would be made available 3 years after start date in time for mid term review of RWSSP implementation.

5.7 Staffing. Core skills required for this type of study would include an epidemiologist, statistician and nutritional anthropologist (details would be spelled out in the Final Report).

2. **In-home Water Treatment (US$ 0.13 million)**

5.8 The study would test the technical effectiveness and social-acceptability of in-home chemical treatment technology to meet bacteriological standards in schemes where surface water sources are used for rural water supply. System treatment is impractical for surface water sources because of high capital and operating costs as well as the lack of operation and maintenance skills. Yet surface water sources are subject to contamination, and without provision for the maintenance of bacteriological quality, rural schemes could result in bacteriologically contaminated water being supplied to public taps, with predictable results.

5.9 Even when water sources are uncontaminated, treatment and storage options are advisable in homes to ensure safe potable water due to demonstrated recontamination after collection (ENPHO/DISVI, 1991). Boiling water before consumption is impractical, as boiling requires large fuel inputs (for instance about 1 kg. of firewood per liter) and would contribute to deforestation in rural areas. In-home chemical treatment (using halogen compounds) is inexpensive and may offer a suitable way to maintain bacteriological quality in individual households. It is also a practice that can be taken up by individual families (particularly women) to maintain child and family health.

5.10 Methodology. The study would review current methods for in-home water treatment and test the cost-effectiveness and acceptability of alternative measures. The study would develop three to five alternative chemical treatment methods using halogen compounds suitable for in-home chemical treatment in rural areas of Nepal. This effort will include development of one or more improved in-home water storage containers from materials or parts already available in Nepal.

5.11 Through the use of properly designed field trials, the study would test the technical effectiveness and social acceptability of alternative treatment methods that have been developed in the laboratory. Potential health risks posed by prolonged chemical usage would be assessed. In addition, the economics of in-home chemical treatment will be analyzed under each alternative tested. Both improved and existing in-home storage containers will be tested in the field trials.

5.12 Staffing. Core skills required for this study are health anthropologist, water quality analyst and economist. Detail manpower and time and budget required will be incorporated in the Final Report.

3. Low Cost Technologies (US$ 0.08 million)

5.13 The proposed RWSSP would deliver water supply and sanitation services that can be managed and sustained by the community. Hence technology choices should be simple, economical and easy to construct and maintain.

5.14 Objectives. The main objectives of the study are to:

(a) develop simple, sustainable and cost effective technologies suitable for rural communities;

(b) investigate availability of different technology options suitable to different communities.

5.15 Methodology. Different technology options for system components of gravity and spring protection systems that are easy to construct with local materials exist for source development, storage, sedimentation treatment, BPT, flow distribution and regulation and tapstand structures. Similarly options for rain water harvesting in uphills, lift tubewell in foot hills (where deep well drilling is necessary) need to be explored.

5.16 Sanitation technologies are not well developed in Nepal. In the hills a single pit latrine is used. In the terai seasonal flooding cause the walls of the pit to cave-in. To avoid caving-in, the walls of the pit are lined with concrete but this technology is expensive. Other sanitation technologies would need to be investigated.

5.17 An initial listing of areas which require attention include: (a) cost-effectiveness of alternative hand pumps in Nepal, (b) low cost methods for sinking deep tubewells, (c) development of locally produced push-fit fittings, (d) low cost methods for costructing sanitation super structure and (e) other low cost design structures for gravity system.

5.18 Staffing. Core skills required are rural water supply and sanitation engineer, social scientist and economist. Details on other staff requirements, time and budget are provided in Table 5.1.

Table 5.1: Staff and Cost Estimate for Low [illegible] Technology Study

Activity	Sanitary Engineer	Sociologist	Economist	Survey Overseers	Draft Person	Totals
1	0 25	0.25				
2	0 25	0.25	0 25	1.00		
3	0 75	0.75	0.50	3.00	0.50	
4	0 50	0.50	0.25		0.50	
5	0.25	0.25				
Total mm	2.00	2 00	1.00	4.00	1.00	
Fees @ US$/mm	1,000	1,000	1,000	200	200	
Fees US$	2,000	2,000	1,000	800	200	6,000
Local Subsistence, at (US$/day)	10	10	10	5	5	
"days	60	60	30	120	30	
Local subsist, travel US$	600	600	300	600	150	2,250
Vehicle Expense						1,900
Office, reports, etc						2,000
Subtotal						12,150
Contingency @	10%					1,215
Total (US$)						13,365

4. <u>Detailed Demand Studies</u> (US$ 0.14 million)

5.19 The proposed RWSSP is built to support delivery of demand-led and cost effective water supply servicies to rural community that they can sustain. The project success would depend on effectively responding to such demand. Essential underpinning of project justification is that there is demand for facilities, and that the value of facilities exceeds the cost. In addition, understanding demand is essential for determining optimal design criteria (households per tapstand or per well, distance to sources, etc.) and for developing viable systems for mobilizing as many resources as possible from beneficiaries while ensuring that they realize potential benefits of schemes.

5.20 Estimating demand is notoriously difficult to do reliably and often seems to involve high costs. The proposed study would seek to provide elements to improve demand estimation.

5.21 This study would be complementary with other R&D and study activities, especially monitoring and evaluation work, and the health impact study.

5.22 <u>Study Objectives</u>. The main objectives of the study are to:

(a). Develop robust reliable and cost-effective methodologies for estimating demand for water supply and sanitation facilities, and the valuation placed on them by rural communities, which can be used in carrying out pre-feasibility, feasibility, and monitoring and evaluation work;

(b). Improve measures of demand for different types of schemes which can be used to calibrate design standards and demand information required under the present project.

5.23 Methodology. Demand for purposes of this study will cover, at a minimum, the quantities of water consumed by households and the costs of collecting, storing and using it. The analysis will also need to take account of: (a). the money valuation of water (in terms of the value of time saved from improved water supplies, or using other methodologies, and (b) the possible implications of health considerations for valuation, for example, differences in valuation when communities are aware of health benefits. These topics are expected to be important issues in the impact monitoring activities and the health impact study activity of the project. The exact definition of scope for the demand study needs to be done in the context of these other activities. The study will involve:

(1). Review literature on rural water supply and sanitation demand, and the relationship between demand and design standards. This should include a review of Bank documents -- Time for a Change, and work on willingness to pay (provide citations) together with studies which have been carried out in Nepal (including the AIIPH 1992).

(2). Review reliability and cost-effectiveness of procedures being followed by JGFFT and SOs under RWSSP on the basis of analysis of data, interviews with staff, and limited field work.

(3). Based on above information, plus additional field work as required as regards performance of past demand assessment methods, make recommendations on improved methodologies for support organizations, Fund Staff, and M&E activities.

(4). Following client approval, field test the most promising methodologies. The tests should include carrying out all relevant surveys and analyses of results. Make recommendations on future demand estimation for (a). support organizations, (b) M&E activities. Results should also include proposed changes in "standard" benefit measures used in applying subproject eligibility criteria.

(5). Carry out revised tests using best methodology from earlier steps, and define detailed recommendations including sampling fractions, interview formats, timing and frequency of surveys, and systems for data analysis, detailed training materials for use by SOs, Fund, or M&E staff for future application of the methodology.

5.24 Staffing. The study would require an economist, water supply and sanitation engineer and survey specialist. Staff details, time and budget requirements are provided in Table 5.2.

Table 5.2 Staffing and Cost Estimate for Demand Study

Activity	International Economist	Local Economist	Local Engineer	Survey Specialist	Field Survey Staff	Totals
1	0.25	1				
2	0.5	2		1	4	
3	1	2		2	4	
4	1	3		3	10	
5	1	3		2	4	40.75
Total mm	3.75	11		8	40.75	
Fees @ US$/mm	15,000	1,500	1,000	1,000	200	
Fees US$	56,250	16,500	0	8,000	3,600	84,350
Intn'l Travel-trips	4					
@ Ticket cost	3,000					
Intn'l Travel, Cost US$	12,000					12,000
Local Subsistence,						
at (US$/day)	125	10	10	10	5	
"days	90	99		160	485	
Local subsist, travel US$	11,250	990	0	1601	2,430	16,271
Vehicle Expense (arbitrary for the moment)						6,000
Office, reports, etc (arbitrary for the moment)						6,000
Subtotal						124,621
Contingency @	10%					12,462
Total (US$)						137,083

5. Study on Policies to Promote Private Provision of Rural Water Supply and Sanitation Service (US$ 0.07 million)

5.25 A basic objective of the RWSSP is to develop provision of WSS services to the lowest level of government possible, and preferably to the private sector where feasible. This requires review of the efficiency of existing private and public practices. Improvements may require changing unsatisfactory past practices, and possibly developing new programs to handle issues not previously dealt with.

5.26 Study Objectives. The main objectives of the study are:

(a) to identify policy constraints to efficient service delivery by the private sector; and

(b) to recommend measures to improve efficiency of private supply of WSS services.

5.27 **Methodology.** The study would focus on the following:

1. Review literature on rural water supply and sanitation service delivery and roles of government and private sector.

2. Identify policy constraints to efficient private supply. A non-inclusive list would include:

(a) HMGN regulatory policies regarding imported and local production of sector inputs (pumps, pipes, etc.).

(b) subsidy by HMGN or INGOs of supplies of spares or other inputs (HMGN production, making subsidized spares available in some cases involves administrative hurdles to securing access, but simultaneously reduces private incentives to stock spares, resulting in poor services).

(c) as a subset of (b), HMGN subsidization of supply of technical staff through the DWSS (which tends to reduce the incentives for potential demanders to engage staff on the market, or for technical personnel to offer their services, especially in more remote areas)

(d) ignorance by private traders or manufacturers of demands for sector goods or services. While this is not in the first instance a policy constraint, HMGN may be able to help overcoming this constraint through policies on design standards, publicity to relevant enterprises, or possibly temporary pump-priming subsidies.

(e) lack of demand because of ignorance of potential users, implying need for appropriate educational inputs at local levels, and

(f) ignorance by manufacturers of possible improvements (again, not a policy constraint, but an area possibly requiring additional HMGN R&D or industrial extension work. This study would be related to studies on improved technologies).

3. Interview relevant market participants (traders, manufacturers, technical professionals, coops (which are involved in subsidized distribution of some spares), HMGN officials, NGOs, WUC members) to assess the incidence of identified inefficiencies. Assess the extent to which inefficiencies are general, or vary geographically.

4. Recommend policy improvements to ensure that private sector makes more constructive contribution to delivery of services. Recommendations may include:

(a) specific policy recommendations

(b) types and levels of actions required (e.g., in training or extension work), and/or

(c) additional feasibility work to be carried out by other studies on specific items.

5.28 Staffing. Core skills required are an economist, water supply and sanitation engineer and survey specialist. Staff details, time and budget requirements are provided in Table 5.3.

Table 5.3: Manpower and Cost Estimate for Study on Policies to Promote Private Provision of Rural Water Supply and Sanitation Service

Activity	International Economist	Local Economist	Local Engineer	Survey Specialist	Field Survey Staff	Totals
1	0.1	0.5				
2 & 3	1	2	1	0		
4	0.5	1	1	0	0	
Total mm	1.6	3.5	2	0	0	7 1
Fees @ US$/mm	15,000	1,500	1,000	1,000	200	
Fees — US$	24,000	5,250	2,000	0		31,250
Intn'l Travel - trips	2					
@ Ticket Cost	3,000					
Intn'l Travel Cost, US$	6,000					6,000
Local Subsistence, travel						
at (US$/day)	125	10	10	10	5	
" days	45	32	36	0	0	
Local subsist, travel US$	5,625	315	360	0	0	6,300
Vehicle Expense (arbitrary for the moment)						1,000
Office, reports etc. (arbitrary for the moment)						3,000
Subtotal						47,550
Contingency @	10%					4,755
Total (US$)						52,305

6. Special Sector Monitoring Study (US$ 0.23 million)

5.29 The study would include funding for special sector monitoring activities which would be managed by NPC. It would monitor and evaluate SO implementation performance and project impact. Specific studies would be carried out during the entire Project period to generate information on successes and failures to provide information to define future policies and investment decisions.

7. Preparation of a Follow-up Project (US$ 0.31 million)

5.30 A preparation package to develop further follow-up programs incorporating lessons learnt and experience gained from the present community-based approach.

VI. SUPPORT ORGANIZATIONS AND SERVICE AGENCIES

A. Institutional Partners of the RWSS Fund

6.1 This chapter reviews a sample of organizations currently engaged in RWSS and/or related activities to assess their capacity to undertake RWSS sub-projects. The institutional partners of the RWSS Fund have been defined according to three categories: Support Organizations (SOs), Service Agencies (SAs) and those organizations that combine aspects of both Support Organization and Service Agencies (SO/SAs).

6.2 Support Organizations (SOs). SOs are organizations that would assist beneficiary communities to take a leading role in the decision making process concerning the identification, design, implementation and maintenance and operation of their water supply and sanitation scheme. They include local governments, nongovernmentnal organizations and community-based organizations. SOs would meet established eligibility criteria (see chapter IX) before they qualify as SOs for the RWSSP.

6.3 Service Agencies (SAs). SAs comprise institutions that provide specialized services to strengthen the capacity of SOs and communities to implement sub-projects. These functions include training, the development and supply of software materials, monitoring, evaluation, technical assistance, and the supply of hardware materials. SAs would also provide technical services directly to the Fund in areas such as communications, material production, research and development, monitoring and evaluation and conducting special studies and impact assessments.

6.4 Support Organizations/Service Agencies (SO/SAs). A few organizations combine aspects of SO and SA, working jointly in partnership with the communities and at the same time offer technical services to other agencies.

B. Support Organizations

6.5 Nongovernmental organizations (NGOs) representing national, regional and local, community-based organizations (CBOs) and village development committees (VDCs) were assessed on their approach to service delivery, organizational structure and management, sustainability, staffing, and institutional capacity to implement RWSS sub-projects (see Annex 6 for details).

1. Nongovernmental Organizations

6.6 There are 3 groups of NGOs that have the potential to function as SOs. These are the national NGOs, regional NGOs and local NGOs. Their nature and implementation capacity are highly variable (Table 6.1). A large majority of NGOs are welfare oriented, their main purpose being to "serve the community and the underprivileged". The emphasis on full service delivery has encouraged a beneficiary-benefactor relationship. This type of relationship has not fostered the growth of community capacity for self reliant development.

6.7 Most NGOs are typically managed by a volunteer executive Board consisting of 7-11 members each with a designated position. The executive Board often consists of the community elite. The Board members are responsible for negotiating with funding agencies and supervising implementation. When a proposal is funded Board members often function as paid staff of their NGOs except in the case of national NGOs. Many NGO members are politically motivated and enjoy considerable influence within their own community. It is quite common for one individual to be a member of two or three NGOs.

6.8 <u>National NGOs</u>. National NGOs are organizations that have chapters in all districts. They generally have a well institutionalized management structure, are o [illegible]en bureaucratic and allow little autonomy for their district chapters. As a result projects are often target-oriented. Their major strength is the availability of sector specific expertise and a well established network.

6.9 The Nepal Red Cross Society (NRCS) with chapters in all 75 districts is the leading national NGO in the water sector with 10 years of experience. With its present staffing it has the capacity to implement 20 schemes per year on average. Many chapters of NRCS have implemented over 100 water supply schemes. They have the advantage of being able to tap the resources of their parent organizations.

6.10 <u>Regional NGOs</u>. Regional NGOs are organizations that operate in multiple districts either from the center or from district headquarters through fielding of supervisory and field staff. A few larger regional NGOs consist of professionally qualified Board members in contrast to local NGOs. A major advantage of these groups is [illegible]ir ability to appropriate skilled professionals on demand, and to serve as a bridge between the RWSSP and grassroots organizations. Their implementation capacity at present ranges from 6-10 community-based schemes.

6.11 <u>Local NGOs</u>. Lc[illegible]l NGOs are organizations that work in only one district. They are active and effective in mobilizing community resources to undertake a wide range of development activities. One institutional weakness of the majority of local NGOs is most of their staff are volunteers. Nonetheless, it is the smaller local NGOs that are able to raise resources and mobilize the community for collective work. They are flexible in adapting to local conditions, enjoy good rapport with the community and can render micro-assistance. In addition they are able to mobilize voluntary work from their members as and when needed. A few larger local NGOs have the ability to focus in one area with a long term perspective. This has been attributed to support from external organizations and leadership within the NGO.

6.12 Most local NGOs do not seem to have specific criteria for selection of projects. Decisions relating to selection of projects are likely to be made on the basis of personal knowledge or representation from specific Board members. Smaller local NGOs do not have good book keeping practices which are required for larger projects although they keep records of financial resources mobilized internally such as membership fees, and proceeds from charity and cultural activities.

Table 6.1: Qualitative Assessment of SOs

Organization	Type	Program Accountability	Sustainability	Management	Capacity to implement
1. Nepal Red Cross Society (NRCS)	National	* some degree of community need based programs. * adequate technical manpower.	* moderate level of community participation. * inadequate fund for O&M and cost recovery * women's involvement low.	* inadequate M&E * centralized decision making * adequately defined job description.	* well institutionalized. * wider coverage of services. * implement 20 schemes per year on average
2. Rhino Club	Local	* moderate technical capacity	* some community participation.	* mostly volunteer staff	* not well institutionalized
3. Narayangarh Youth Club	Local	* moderate technical capacity	* some funds for O&M.	* defined job description.	* mostly part time staff
4 Diyalo Pariwar	Local	* moderate technical capacity	* moderate degree of women's involvement.	mostly volunteer staff	* covers only accessible areas within the district
5. NFESC	Regional	* community need based. * moderate technical capacity.	* moderate level of community participation * use literacy as entry point. * some funds for O&M * women's participation low.	* defined job description. * weak monitoring system	* well established institution * operates in a number of districts. * implemented 18 water supply schemes so far
6. Tamakosi Sewa Samiti (TSS)	Local	* community need based * adequate technical and management capability.	* high degree of community participation. * some funds for O&M * women's participation low	* weak monitoring system * defined job description.	* working in one district for eight years * implemented 30 water supply schemes.
7 Samaj Sewa Samuha (SSS)	Local	* community need based. * moderate technical capacity.	* able to raise O&M funds when required.	* weak monitoring system.	* implemented 2-3 water supply schemes

Organization	Type	Program Accountability	Sustainability	Management	Capacity to implement
8. NRCS/ District Chapter	Local	* moderate technical capacity	* able to mobilize community resources. * high community participation	* inadequate M&E.	* experience in implementing 4-6 schemes per year
9 CBOs	Local	* strong community need based. * weak technical capacity.	* high degree of community participation. * able to raise funds for O&M when required. * some degree of women's participation * high degree of community ownership and involvement.	* adequate informal monitoring system. * participatory decision making	* limited capacity to implement water supply schemes. * probably can implement 1-2 schemes per year. * mostly informal organizations.
10. VDCs	Local	* community needs based. * lack technical and management capability.	* some community participation. * lack O&M fund. * low women's involvement.	* inadequate M&E. * low staff motivation. * job description not defined. * low management capacity	* limited capacity to implement schemes. * Probably can handle 1-2 schemes per year.

Source: Consultant's Assessment.

6.13 Water supply projects undertaken by local NGOs have been small primarily due to financial limitations and weak managerial capabilities. Most local NGOs do not have technical staff. However, they have demonstrated ability to recruit technicians on contract or tap technical assistance from their members and/or district line agencies. Informal contacts is a contributing factor for developing the linkages between an NGO and the line agencies. Many local NGOs utilize DWSO technical personnel to design water supply systems through non-official channels. The technicians are recruited for a specific assignment and are paid a fee for their services. Local NGOs have the capacity to implement 3-6 community-based schemes.

2. **Community Based Organizations**

6.14 CBOs are generally informal organizations and their members are themselves beneficiaries of their activities. There are three types of CBOs: indigenous, self help and externally formed (see Annex 6 for details). The performance and capacity of a CBO for service delivery depends on how representative it is of the community. Indigenous and self-help CBOs are centers of community interaction and the focal point of decision making, mediation and control. Unlike externally formed CBOs they are able to mobilize financial and human resources, and are willing to undertake attendant obligations to the project. Capacity within CBOs is lacking in financial management systems. For activities limited within the beneficiary community the informal accounting system is perceived as appropriate and sufficient to ensure financial transparency.

6.15 There is a growing trend among CBOs within a locality to form an association with a more formal structure to improve services to their members. The association is managed by a committee made up of representatives of different CBOs. CBO associations show considerable potential to function as SOs as they would be able to utilize resources more efficiently than individual CBOs. Individual CBOs have the capacity to implement one drinking water scheme.

3. Village Development Committees

6.16 Village Development Committees (VDCs) lack development orientation, have little track record and have less capacity than other SOs. Personnel management are often poor and staff incentive is inadequate. At present VDCs have minimal human and budgetary resources with which to carry out RWSS activities. There is also the danger that the genuine desire of many VDC members to carry out development work could be mingled with political considerations.

4. Manpower Assessment of SOs

6.17 Detailed manpower assessment were carried out for a sample of 7 NGOs, 5 CBOs and 1 VDC to assess their capacity to implement RWSS subprojects (Tables 6.2-6.3). With the exception of the CBOs and VDCs all the NGOs have at least a community development worker or a HSE personnel on staff. Most local NGOs generally do not have technical staff such as engineers/overseers except for the more experienced organizations. Most local NGOs operate with a small core staff usually a coordinator and 1 or 2 support staff. They generally do not have staff with specialized skills. Exceptions to this are a few larger and more experienced NGOs who employ a project coordinator or specialist staff in health/community development. Larger NGOs have a few technicians on staff.

6.18 Community activities undertaken by different SOs vary in intensity and duration ranging from 2-6 weeks. Activities include needs assessment, community organization and UC formation. Those organizations that seek to encourage broader participation of the community tend to invest more time. The SOs reviewed use water as the entry point from which other activities develop.

6.19 The majority of SOs are judged to be weak in hygiene and sanitation education (HSE). Person days spent in HSE and related activities range from 1-4 weeks per scheme. HSE and related activities are not well integrated with water supplies.

6.20 Most SOs reviewed complete construction in one season which take 2-6 months per scheme depending upon scheme size and type. Smaller local NGOs do not provide VMW training and do not as a rule have a sanitation component to complement water supplies.

Table 6.2: Manpower Assessment of SOs Relating to RWSS

SN.	Organization	Type/Level	Software				Hardware				Support Staff		Total
			Com/Dev	HSE	NFE	Trg.	Eng	OS	SOS	Tech	Mgt.	Support	
1	NRCS-DWSP	National	2	1	-	1	3	-	-	-	4	6	17
		District											
		Hill (4)	1	4	-	-	-	1		1	1	2	10(4)
		Terai (3)	1	14			-	-	4	1	1	2	23(3)
2	NFESC	Regional	7	4	14	-	*	*	*	2	1	-	28
3	TSS	Local	6	5	-	-	-	2		1	1	2	17
4	SSS	Local	2	3	-	-	-		1	-	1	2	9
5	NYC	Local	3	3	-	-	*	*	*	-		1	7
6	DIYALO	Local	3	-	-	-	*	*	*	-		-	3
7	RHINO	Local	3	-	-	-	*	*	*				3
8	CBOs	Community	-	-	-	-	*	*	*	-		-	
	Ramitar	"	-	-	-	-	*	*	*	1			
	Bhamarkot	"	-	-	-	-	*	*	*	1			
	Dumsikharka	"	-	-	-	-	*	*	*	1			
	Kankre	"	-	-	-	-	*	*	*	1			
	Tusal	"	-	-	-	-	*	*	*	1			
9	VDCs	Local					*	*	*	-	1	1	2

* Receives technical support from ESA.

Source: Different Sources.

Table 6.3: Assessment of RWSS Related Activities Undertaken by SOs

SN.	Activities	NRCS	NFESC	TSS	SSS	NYC	DIYALO	RHINO	CBO	VDC
		Hills (2-4)	(6)	(5)	(3)	(1)	(1)	(1)	(1)	(1)
		days/schem	days/schem	days/schem	days/schem	days/schem	days/schem	days/schem	days/schem	days/schem
A	Community Mobilization Needs assessment UC formation	30	21	10	24	38	45	21	30	30
B	NFE	-	180	-	180	180	180	180	-	-
C	Health/Hygiene Survey	-	-	6	-	7	25	-	-	-
D	Survey & Design	21	5	5	30	7	9	30	7	7
E	HSE	26	-	12	7	15	-	-	-	-
F	Water Supply Construction	180	60	150	180	180	180	180	90	120
G	Sanitation Latrine construction	7								

Source. Different Sources.
N.B. Numbers within parenthesis denote average number of schemes implemented per year.

C. Service Agencies

6.21 Service agencies (SAs) reviewed include government, private, and nongovernmental organizations. The SAs are broadly categorized into 4 areas: training, monitoring and evaluation, material development and suppliers and manufacturers (Table 6.4).

Table 6.4: Qualitative Assessment of SAs

Organization	Type	Program Accountability	Sustainability	Management	Capacity to implement
1 CHRDU/DWSS	HMG/training	* inadequate technical capability	* in transition * lack resources	* inadequate incentives. * unclear job description of staff.	* trained only DWSO staff * if properly institutionalized, has potential to serve as training resource to SOs in future
2 DPHO	HMG/material development, training	* inadequate technical capacity	* lack resources	* inadequate incentives. * staff not motivated	* focus on curative medicine. * has only one HSE trainer * HSE methods didactic
3. DWSO	HMG/M&E, training.	* adequate technical capacity * projects not need based	* lack participatory approaches to implement RWSS development	* inadequate incentives * staff not well motivated	* staff skills and orientation inappropriate to community based RWSS
4 SAP/Nepal	INGO/training	* adequate manpower * supports local SOs on long term partnership	* well institutionalized. * adequately funded	* strong management capability * well defined job description. * strong in M&E	* several years of experience in NGO strengthening.
5. RDC/UMN	INGO/training	* Adequate technical and managerial capability	* Strong institutional base. * Adequate resources.	* Sufficient staff motivation * well defined job description.	* number of years of experience in training support to SOs in drinking water
6. MTRC	Private/ training and research.	* adequate technical manpower	* lack resources.	* adequate staff motivation. * management capability sound.	* Five years of experience in training public and NGO sectors in management, leadership and project planning

Organization	Type	Program Accountability	Sustainability	Management	Capacity to implement
7 RCPHC	NGO/material development.	* has technical staff of 7.	* donor dependent for resources. * own resources inadequate	* well documented information on health.	* few years experience in materials development in health, VHW and training material.
8 NGO Forum	NGO/training.	* has professional staff of 6.	* Seeking donor support. * own resources not sufficient	* inadequate management base	* few years of experience in training on NGO capacity building
9 Women Training Center	HMG/training	* adequate technical staff	* own resources not sufficient	* staff not well motivated	* experience in leadership, skill and management training
10. Women Awareness Center Nepal	NGO/training.	* projects need based	* own resources not sufficient	* adequate staff motivation * well-defined job description	* Experience in leadership and skill training to rural women
11 ENPHO	NGO/training.	* sufficient managerial capability.	* financial support from DISVI.	* adequately motivated staff. * well-defined job description.	* Experience in providing technical and management support to NGO
12. CEMAT	private consulting firm/ engineering.	* adequate technical staff	* sufficient own resources * financially strong and self-reliant	* adequate staff motivation and payments. * clearcut technical tasks and responsibilities.	* working experience of more than 10 years in engineering, design and M&E of water supply projects
13. SKILL	NGO/training	* small technical staff	* own resources not sufficient	* staff motivated	* experience in training WSST
14 IFCD	NGO/training, material dev.	* has professional staff of 5	* own resources not sufficient	* staff motivated	* experience in developing materials on NFE
15. HURDEC	Pvt/training	* adequate technical capacity	* own resources not sufficient	* attractive incentives. * motivated staff	* experience in management training

Organization	Type	Program Accountability	Sustainability	Management	Capacity to implement
16. WIF	INGO/material	* adequate technical capacity in development communications	* has own resources	* attractive incentives * staff well motivated	* experience in making video films e.g. health and nutrition
17 DDC	Local govt/M&E	* projects not need based	* own resources not sufficient	* staff not well motivated * remuneration low	* monitor DDC funded projects. * do not provide services to nongovernmental and private organizations.
18. DEO	HMG/material, training.	* projects target oriented.	* insufficient resources	* poor remuneration. * staff not well motivated	* produces NFE materials, and trains NFE facilitators
19 Nepothene	Pvt/hardware supplier	* adequate manufacturing capacity of 300-400 metric tons. * delivers orders upto 10 tons (truck load)	* financially sound	* adequate distribution network.	* Several years of experience in manufacturing and supplying pipes.
20. Panchakanya	Pvt/hardware supplier	* adequate manufacturing capacity of 300 to 400 metric tons * delivers orders up to 10 tons(truck load)	* financially sound.	* adequate distribution network. * well-defined job responsibilities	* Several years of experience in manufacturing and supplying pipes.

Source. Consultant's Assessment.

1. **Training Institutions**

6.22 Training is offered through government line agencies, bilateral and multilateral donors, national and international NGOs and private training institutions. Detailed manpower assessments were made on a sample of 10 training institutions (Tables 6.5-6.6). Some training organizations conduct training only on hardware such as plumbing, ferrocement tank construction and O&M, while others on NFE, HSE, leadership building, and financial and management training. The capacity of government training institutions to offer services to the RWSSP is limited, both by the regular workload of their staff and bureaucratic procedures involved in providing incentives for government staff. They generally do not render training services to NGOs.

Table 6.5: Manpower Assessment of Training SAs

SN	SAs	Type	Software							Hardware		Adm Support		
			Management Training							OS	Sup &	Mgt.	Support	Total
			Prog.	HRD	Acct.	M&E	NFE	HSE	Eng	SOS	Tech			
1	CHRDU	HMG							1	2	1	1	6	11
2	SAP-Nepal	INGO	3	4	1	3						4	8	23
3	MTRC	Private	2	2	1	1						1		7
4	NGO-Forum	NGO	1				1					2	1	5
5	WAC	NGO	1	2									3	6
6	WTC	HMG	2	2	1	1					2	1	15	24
7	SKILL	NGO								2		2	2	6
8	IFCD	NGO	3				1					1	2	7
9	DEO	HMG				4	50*					2	15	71
10	HURDEC	Private	9	2								1	2	14

* NFE facilitators recruited for 6 months
Source: Different Sources.

6.23 Training services offered by INGOs and private training institutions are better able to expand their training capacity to meet demand. Most private training institutions are able to organize specialized courses to meet the needs of a particular client.

6.24 Bilateral and multilateral donors, on the other hand, are more flexible and would be able to expand their training to include technical staff working with SOs.

2. Institutions for Material Development

6.25 There are only a handful of organizations that are capable of producing participatory materials to support RWSS related activities. The Health Education Section of the MOH is responsible for producing health education materials. The section has not been able to recruit personnel with creative abilities to produce innovative work.

Table 6.6: RWSS Related Activities of Training SAs

SN.	Activities	CHRDU		SAP-NEPA		MTRC		NGO-FORU		WAC		WTC		SKILL		IFCD		DEO		HURDEC	
		# of days	Trg/yr	# of days	Trg/yr	# of days	Trg/yr	# of days	Trg/yr	# of days	Trg/yr	# of days	Trg/yr	# of days	Trg/yr	# of days	Trg/yr	# of days	Trg/yr	# of days	Trg/yr
A	**SOFTWARE**																						
1	Management training	35	2	60	5	21	4	8	6	5	5	21	5							14	10
2	Leadership/skill			21	5	63	14	7	1	5	5	6	5								
3	Resource mobilization			7	5																
4	M&E			4	5			5	1												
5	NFE facilitator							10	5									10	2		
6	HSE	30	2													43	14				
7	UC training	7		7	5																
B	**HARDWARE**																				
1	WSST	42	2			63	3							45	2						
2	Sanitation Technician													16	1						
3	Repair & Maintenance													16	1						
4	VMW	30																			
5	Others													15	1						

Source: Different Sources.

6.26 Three potential nongovernmental SAs for materials development were reviewed (Table 6.7). These organizations develop health and NFE materials for new literates. A few also train government and nongovernmental organizations on primary health care. All three organizations have qualified staff and have the potential to develop materials for RWSS related activities, but would need guidance with content and presentation.

3. SAs for Monitoring and Evaluation

6.27 The organizations involved in these services include private consulting firms, NGOs and INGOs. There are many qualified private firms that are able to carry out formal evaluations of projects and to conduct special studies. Many would also be able to provide technical personnel to assist SOs to design and construct water supply schemes.

6.28 Six SAs representing government, nongovernment and private institutions were reviewed for research and development and M&E services (Table 6.8). Government line agencies are primarily involved in conducting M&E of their own programs and generally do not render services to NGOs, CBOs UCs and VDCs.

Table 6.7: Manpower Assessment of SAs Involved in Material Production

SN.	SAs	Type Level	SOFTWARE Com/Dev	NFE	HSE	Others	Support Staff Admin Mgt	Support	Total
1	RCPHC	NGO, Health Material prodn	2		2		2	2	8
2	IFCD	NGO Training & NFE Material Prod.	3	1			1	2	7
3	WIF	INGO, Health Material Prod.	3		2	3		2	10

Source: Different Sources.

Table 6.8: Manpower Assessment of M&E/R&D Studies

SN.	SAs	Type Level	SOFTWARE RD/ M&E	NFE	HSE	Others	HARDWARE Eng	OS	SOS	Tech	SUPPORT STAFF Admin. Mgt	Support	Total
1	IIDS	NGO	17			45 field staff					8	10	80
2	MTRC	Private	6								1		7
3	DOC	Local govt.							3	2	2	3	10
4	DEO	HMG/line agency	4								2	9	15
5	SAPPROS	NGO	11			6	2	2	2		1	3	27
6	DWSO	HMG/line agency			6		2	8	8	20		7	51
7	DPHO	HMG/line agency			1	5					1	8	15

Source. Different Sources.

4. Suppliers of Hardware Materials

6.29 Private manufacturing firms are able to complement government service delivery systems. Most manufacturers conform to ISI standards but there is wide variety in the type and quality of handpumps and fittings available in the market. Pipes are generally in the market but the SOs would have to place orders with sufficient lead time to have materials available in time for construction.

6.30 Two potential suppliers were reviewed for the study (Table 6.9) Suppliers generally require 25%-40% down payment upon placement of order. However, no down payment is required for well reputed institutions. In such cases full payment is made upon delivery of goods. The analysis of SAs providing hardware components indicates that there is sufficient capacity in Nepal to meet the requirements of the RWSS Project for pipes and handpumps. The one area in which Nepalese producers are weak is in fittings, the bulk of which continue to be imported from India.

Table 6.9: Manpower Assessment of Suppliers

SN.	SAs	Type	SOFTWARE				HA[illegible]			SUPPORT STAFF		Total
		Level	Com/Dev	NFE	HSE	M&E	Eng	OS	SOS Tech	Admin. Mangt.	Support	
1	Nepothene	Pvt/hardware pipes, fittings	6				5	8		20	54	93
2	Panchkanya	Pvt/hardware pipes, fittings					2	10	12	5	50	79

Source. Different Sources.

D. Support Organization/Service Agencies

6.31 A number of experienced support organizations have begun to share their expertise by offering training and technical services to other SOs, bilateral, multilateral, INGOs and HMG, thus serving the role of service agencies (Table 6.10). As a group, SO/SAs represent a fairly strong set of institutions. Although the number of SO/SAs is not as large as the number of SOs or SAs, when taken individually they have substantial capacity to implement water supply and sanitation projects.

Table 6.10: Qualitative Assessment of SO/SAs

Organization	Type	Program Accountability	Sustainability	Management	Capacity to implement
1. Save the Children/USA	INGO/ com.dev	* adequate technical and managerial support. * community needs based. * NFE as entry point.	* some funds for O&M * women's involvement high	* staff motivation high * adequate M&E * well defined job description.	* Twelve years experience in community development. * Phased out from water supply. * Emphasis in NFE.

Organization	Type	Program Accountability	Sustainability	Management	Capacity to implement
2. Redd Barna/Save the Children (Norway)	INGO/ com.dev.	* sufficient managerial and technical support.	* moderate community participation * some funds for O&M. * women's involvement to some extent.	* high staff motivation. * sufficient M&E * clear job description.	* Operates in 5 VDCs. * focus in health education, NFE & income generation
3. Lutheran World Service	INGO/ com.dev.	* community needs based. * strong technical capability to undertake water supply project.	* community participation. * funds for O&M * women's participation not so strong.	* motivated staff. * adequate job description. * effective M&E	* implemented 60 water supply schemes in the west and mid-west regions over five years period. * NFE and water supply as entry points. * emphasis in hygiene and sanitation
4. USC/Canada	INGO/ com dev.	* community needs based. * technical and management support to NGOs and community on long term basis. * support water supply and NFE.	* community participation. * relatively small INGO.	* adequate management * motivated staff.	* Sixteen years experience in health, water supply and NFE. * supports 5-6 water supply schemes annually
5. HELVETAS	INGO/ CWSS	* community based water supply * strong technical and software support in the sector. * strong training component.	* strong community participation. * strong women involvement program. * one of the largest INGOs in the sector.	* strong M&E. * highly trained and motivated staff. * well defined jobs.	* Seventeen years experience in CWSS. * implemented 304 water supply schemes in western development region. * initiating innovative SRWSS in the region

Organization	Type	Program Accountability	Sustainability	Management	Capacity to implement
6. FINNIDA	Bi-lateral/ RWSS	* adequate technical staff	* adequate resources of its own.	* well motivated staff * strong M&E	* several years experience in the western region. * strong in providing technical services.
7. IIDS	NGO/ action research	* some degree of community need based * adequate professional manpower in community development.	* well established institution. * can generate resources. * community mobilization	* not very motivated staff.	* twelve years experience in action research in literacy, income generation, hygiene and sanitation.
8. UNICEF	Multi-lateral/ CWSS	* sufficient technical capacity	* sufficient resources	* staff well motivated	* over 20 years experience. * one of the largest donor assistance in the sector
9. NEWAH	NGO/ water supplies	* adequate technical and managerial capacity	* funds for O&M collected	* staff motivated. * well defined job description	* water focused NGO. * experience in providing technical and managerial support to NGOs implementing RWSS
10. SAPPROS	NGO/com. dev.	* community need based. * adequate technical and management capability.	* some funds for O&M. * Women's participation low.	* staff motivated. * defined job description.	* Two years in operation * operates in a number of districts in the West. * implemented 14 schemes so far. * potential for replicability.

Source. Consultant's assessment.

6.32 Although most INGOs are working in partnership with local organizations, only a few of them have incorporated water supply and sanitation into their programs. A number of NGOs who work directly in communities have begun to provide services to other organizations. They have the capacity to implement community-based schemes themselves and have adequate technical manpower and capacity to monitor and evaluate sub-projects on behalf of the Fund.

6.33 Detailed manpower assessments were carried out on a sample of 5 SO/SAs including government, nongovernment (national and international) and bilaterals. Four of the SO/SAs reviewed are directly involved in implementation of water supply services, while one is more involved in action research activities which aim at creating awareness among rural people of the need for self-help development (Tables 6.11- 6.12). SO/SAs involved in RWSS typically have specialized staff in community development, HSE and engineering and are able to provide training for their field staff and to other SOs as well. None of the SO/SAs reviewed have used NFE in their programs. Of the SO/SAs reviewed HELVETAS which has a more intensive program to enhance women's participation spend longer time in assessing needs and organizing the community. Compared to the SOs reviewed SO/SAs give more emphasis to the software component, and HSE in particular, is more integrated with water supplies.

Table 6.11: Manpower Assessment of RWSS Related SO/SAs

SN	SO/SAs	Type	SOFTWARE						HARDWARE						Total
			Com/ Dev	HSE	NFE	Trg.	RD M&E	Others	Eng	OS	SOS Super	Tech	Mgt.	Sup	
1	HELVETAS	INGO/Training & Implementation	2	7		2	-	-	2	2	-	1	2	2	20
2	IIDS	NGO/Action Research	4	-	-	-	14	33	-	-	-	-	4	13	68
3	SAPPROS	NGO/Training & Implementation	7	-	-	3	1	6	2	2	2		1	3	27
4	FINNIDA	Bilateral/ Training/Impl.	-	8	-	6	-	-	1	-	-	-	8	42	65
5	NEWAH	NGO/Training & Implementation	-	15		-	-	-	5	3	47	5	5	11	93

Source. Different Sources.

Table 6.12: Assessment of RWSS Related Activities of SO/SAs

SN.	Activities	HELVETAS (9) # of days/ scheme	SAPPROS (7) # of days/ scheme	FINNIDA (8)* # of days/ scheme	NEWAH (23) # of days/ scheme
A	Community Mobilization	60	41	45	40
	Needs assessment				
	UC formation				
B	NFE		-	-	-
C	Health/Hygiene Survey	14		14	14
D	Survey & Design	35	5	60	21
E	HSE	210		118	214
F	Water Supply Construction	180	100	205	180
G	Sanitation Construction	14		8	
H	Others				
	WSST Training	175			
	Survey & Design Training	12			
	Plumbing & Masonry	28			
	Ferrocement tank	21			

* Schemes are large covering the entire VDC.
NB. Figures within parenthesis indic... ...verage no. of schemes implemented per year.

E. Staff Requirements for RWSSP Schemes

6.34 Experience from water focused SO/SAs such as HELVETAS, FINNIDA and WaterAid show that implementation of RWSS services require specialized staff to supervise community organization, HSE, and survey and design. The SOs reviewed fall short on appropriate software interventions which would enable communities to take a leading role in the decision making process concerning the identification, design, implementation and maintenance and operation of their water supply and sanitation scheme. A stronger software component would be required to complement water supplies than is currently practiced by the SOs reviewed.

6.35 Preliminary estimation of staff inputs for development phase is presented in Table 6.13. A Community Facilitator (CF), a Hygiene Facilitator (HF) and a hardware personnel would be required to assist the community develop an understanding of the linkage between water supply, sanitation and hygiene education and improved health. The community with assistance from SO facilitators would identify problems and agree on feasible solutions considering technical, financial and socio-cultural conditions (see chapter IV for details). Assuming community size to be 50 households in the hills and 100 households in the terai it is estimated that a community (hill & terai) in the developemnt phase would require 3 months time of 1 CF, 2 months input of 1 HF and about 26 person days of1 overseer, in addition to supervisory input (Table 6.13). In the implementation phase it is 2, 3 and 4 months for the CF, HF and technician respectively, in addition to supervisory staff input. In the post-implementation pnase it is 2, 3 and 1 for the CF, HF and the technician (Table 6.14). Person days required are based on likely time needed for each activity. This would need to be revised and updated in the Final Report as staff inputs in JAKPAS supported schemes are processed.

Table 6.13: Estimate of Staff/Days Required in the Development Phase

ACTIVITIES	SOFTWARE					HARDWARE		
	CS/ days	CF/ days	HS/ days	HF/ days	NF** days	Eng/ days	OS/ days	Tech/ days
DEVELOPMENT PHASE								
1. Community Mobilization								
* CAP sessions for WUC formation		20						
* WUC Training	4	4				2	2	
* Nonformal Education** (optional)		10			180			
3. Hygiene & Sanitation								
* CAP sessions for HSE		10		10				
* Health KAP		7	2	10				
* Participatory HSE				10				
* HSE strategy		7	4	10				
4. Detailed Survey & Design								
* Resource mapping		5					2	
* Source selection		4					2	
* CAP sessions for design/service level		15		10			3	
* Discussions on use/reuse of water		5		7			5	
* Topographical survey							2	
* Engineering design						6	6	
5. Community Action Plan								
* Preparation of CAP as proposal for impl. & post-impl. phases	2	3		3			4	
TOTAL	6	90	6	60	180	8	26	

Source. Consultant's estimate.

** Where NFE is being supported the NFE Supervisor (NS) would be responsible for HSE activities and would function as the community's HF (see chapter IV).

Table 6.14: Estimate of Staff/Days Required in the Implementation & Post-implementation Phases

ACTIVITIES	SOFTWARE				HARDWARE		
	CS/ days	CF/ days	HS/ days	HF/ days	Eng/ days	OS/ days	Tech/ days
IMPLEMENTATION PHASE							
1. Water Supply & Sanitation							
* Community mobilization		10		6			
* VMW Training		2				2	2
* Const. supervision	4	24			10	20	90
* Source protection		6		4			6
* Mason training				2			2
* Latrine construction		10		15		2	20
* WUC training	2	4				4	
2. Hygiene & Sanitation							
* HSE Training			8	8			
* Participatory HSE				45			
* HSE to School Children		4		10			
Sub-total	6	60	8	90	10	28	120
POST-IMPLEMENTATION PHASE							
1. Water Supply & Sanitation							
* O&M				5	2	6	10
* Latrine Construction		10		10			20
2. Hygiene & Sanitation							
* Refresher HSE Training		7	4	7			
* Participatory HSE		15		45			
* Post Health KAP			4	10			
3. Support Services to Women							
* Skill Enhancement Trg.		3		3			
* Special Women Program							
4. WUC Registration	4	15					
5. Monitoring & Supervision		10		10		6	
Sub-total	4	60	8	90	2	12	30
TOTAL	10	120	16	180	12	[illegible]	150

Source. Consultant's Estimate.

6.36 Assessment of potential SOs indicate that in a year a national NGO can undertake 15-20 schemes, a district NGO about 8-10 schemes, and a local NGO 3-6 schemes. VDCs would be ble to manage 1-2 schemes while CBOs are capable of implementing 1 scheme a year. In the first year of RWSSP implementation 125 schemes are anticipated (Table 6.15).

Table 6.15: Expected number of SOs and Number of Schemes in the First Year of RWSSP

	No. of SO	No. of schemes per SO	Total schemes
National Level SO	1	15-20	15-20
District Level SO	4	8-10	32-40
Local Level SO	10	4-6	40-60
VDC	9	1-2	9-18
CBO/CBO Association	6	1	6
	30		102-134

Source. Consultant's Estimate.

F. Options for Collaboration

6.37 JAKPAS supported SOs represent 4 regional NGOs, 7 local NGOs, 1 private firm, 1 INGO and 1 chapter of a national NGO. Of these about 50% have prior experience in implementing rural water supplies. Within each category there is great diversity in terms of approach, experience, methods of operating and technical competence. Whether SOs have delegated sufficient authority and turned over enough control to enable beneficiary communities to take joint responsibility for scheme development and O&M of their completed systems is yet to be assessed.

6.38 Regional NGOs by virtue of it being based in Kathmandu or in district headquarters have the ability to recruit on demand the kind of staff recommended for RWSSP. Two have a track record in rural water supplies the other two are strong in particular areas such as NFE and credit groups. They have the potential to expand and are not limited to a particular geographical area as demonstrated by SOLVE. They usually work through fielding of supervisory and field staff.

6.39 The larger local NGOs such as TSS and NRCS a chapter of a national NGO display characteristics similar to the regional NGOs. But unlike the regional NGOs they live in the service area and operate in only one district. They are likely to increase the number of activities in a district than operate in multiple districts.

6.40 Smaller local NGOs display characteristics of CBOs, are strong in mobilizing the community, have a small focus area, but lack technical and managerial competence. They would require substantial Fund staff input. Indications are they would need to work in consortia with NGOs or private firms in order to manage the SO function of the RWSSP. At present their growth is limited to the immediate community. At the other end are private firms, technically capable but lacking linkages with the community. Collaborations between these two groups would complement one another and simultaneously reduce direct Fund assistance in terms of developing proposals and technical design.

6.41 The JGFFT project in its preliminary set-up phase identified several possible service combinations. These include:

1. RWSS funds a lead NGO who would work directly with users and smaller local potential SOs to deliver services.

2. RWSS funds a national NGO to support several local NGOs and strengthens one or two to [illegible] me a lead SO.

3. RWSS funds a number of weaker SOs directly and helps arrange the services of SA for technical support.

6.42 An assessment of the cost effectiveness of the different institutional arrangements would assist in determining the best feasible options. This would be updated in the Final Report.

VII. ECONOMIC AND FINANCIAL ANALYSIS

7.1 The proposed RWSSP would be justified on the basis of sustainable health and hygiene benefits accruing to the rural underserved population through improved water supply and sanitation services, and improvements in income through time savings for women as water is brought closer to the dwellings in a cost effective and sustainable manner. Adequate and quantifiable data on health benefits of water supplies do not exist. Data on time saving benefits exist but are subject to variations between schemes (gravity and tubewell) and location i.e. terai and hill.

1. Objectives of Economic and Financial Analysis

7.2 The purpose of economic and financial analyses are to:

(a) establish criteria for appraising the economic viability of each scheme;

(b) provide inputs into financial estimates and affordability criteria;

(c) estimate the economic viability of the RWSS Project as a whole; and

(d) recommend what additional data and analysis are needed during Project preparation and Project execution.

2. Proposed Framework for Economic and Financial Analysis

7.3 In order to achieve the above objectives, economic and financial analysis would establish criteria to assess long term sustainability of schemes including community willingness to contribute towards capital and O&M costs. Economic viability of schemes and the RWSS Project as a whole would be established from Benefit/Cost analysis, and an acceptable economic rate of return using IDA (World Bank) method and Program Budgeting method of the Ministry of Finance (MOF). Maximum cost criteria is determined for a given service level for each technology choice i.e. gravity flow, shallow tubewell, dugwell and spring protection (see chapter IV).

7.4 Economic analysis would utilize information gathered on major benefits of water supply and sanitation in terms of time savings, increased water consumption, improved water quality, energy savings and other health benefits associated with different technology choices.

7.5 Sustainability criteria would focus on community willingness to contribute towards capital and operation and maintenance costs. Affordability for different service levels would be assessed and community cost contributions for sustainability would be suggested.

A. Benefits from RWSS

1. Benefits from Time Savings

7.6 Time savings in fetching water is the major benefit of RWSS to rural people, especially women. Fetching water is primarily the responsibility of women who spend as much as 6 hours each day doing this activity for household maintenance.

7.7 Hills. Time savings from RWSS vary considerably from scheme to scheme depending upon water point location and service level. Studies show variation in estimated time savings from water supply schemes (Table 7.1). Binnie and Partners (1990) study of 222 gravity schemes in the Central and Western hill districts estimate average time savings of 7 hours per household per day. This could have been exaggerated as actual quantity of water collected per household and time spent were not measured.

7.8 The feasibility study of community water supply projects (ADBN, UNICEF and WaterAid, 1991) report average time savings of 3 hours per household per day. Another study which reviewed water supply projects implemented by Lutheran World Service (LWS) in the hills of Western Development region indicate average time savings of 2.5 hours per household per day.

7.9 A survey of DWSS/FINNIDA projects in Lumbini, Arghakhanchi (hill) indicate that at service level one[1], a household of 6 persons would save about 3 hrs on average per day compared to households at service levels 3 and 4. Another survey of 13 drinking water projects implemented under Rapti Integrated Development Project estimate time savings at about 4 hrs per household per day.

7.10 A review of a sample of 23 gravity flow water supply projects in the Central, Western and Eastern districts estimate time savings of 1.8 hrs per household per day in the hills and 1.3 hrs per household per day in the terai (SASCON, 1992). The AIIHP study (1992) reviewed 16 gravity schemes in 3 hill districts of Central and Western regions and estimate average time savings of 2 hrs per household per day. Field visits to a few gravity schemes supported by Red Cross (Bhumi Dada) in Kavre district indicate time savings at about 3.3 hrs per household per day.

7.11 Terai. There exists no detail studies, to our knowledge, on quantitative assessment of time savings from tubewell schemes. Evaluation of 73 tubewell schemes undertaken by NRCS in Bara, Parsa, Rupandehi, Kapilbastu, Banke and Bardia districts indicates average time taken to fetch water (per round trip) reduced from 24.7 minutes to 8.3 minutes (HSC, 1992). Since households make about 6 trips (each about 15 liters) time savings from tubewell schemes is estimated at 1.6 hrs per household per day. Similarly DDP (FINNIDA, 1993) data of 348 tubewell schemes in Lumbini suggests that in Rupandehi, Kapilbastu and Nawalparasi districts the average time taken to fetch water before and after improved water supplies are 21 minutes and 6 minutes per trip respectively. This implies time savings of about 1.5 hrs per household per day.

7.12 A study of terai tubewell schemes (Acharya, 1987) indicates households spent 10 minutes (round trip) before intervention to fetch water from open wells and consumed 16 lcd i.e. 91 liters per household per day. After installation of tubewells average time spent per round trip was about

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[1] Service level one is defined as a protected source providing more than 45 lcd at less than 15 minutes walking distance and more than 6 hrs supply all year.

5 minutes and per capita consumption of water increased to about 24 liters per day i.e. 137 liters per household per day. Time savings for tubewell schemes come largely from reduction in congestion. These findings concur with UNICEF evaluations of terai tubewell schemes and our field visits to Lumbini.

Table 7.1: Time Savings from Water Supply Schemes

Study	Location	Type	Average Time Savings/hh/day
Binnie & Partners (1990)*	Hill	Gravity	7 hrs
ADBN/UNICEF/WaterAid	"	"	3 hrs
Lutheran World Service	"	"	2.5 hrs
FINNIDA/ Argakhanchi	"	"	3 hrs
Rapti IRD	"	"	4 hrs
AIIHP/DWSS	"	"	2 hrs
SASCON	"	"	1.8 hrs
	Terai	"	1.3 hrs
HSC/NRCS (1992)	Terai	Tubewell	1.6 hrs
DDP/FINNIDA (1992)	"	"	1.5 hrs
Acharya (1987)	"	"	0.8 hrs

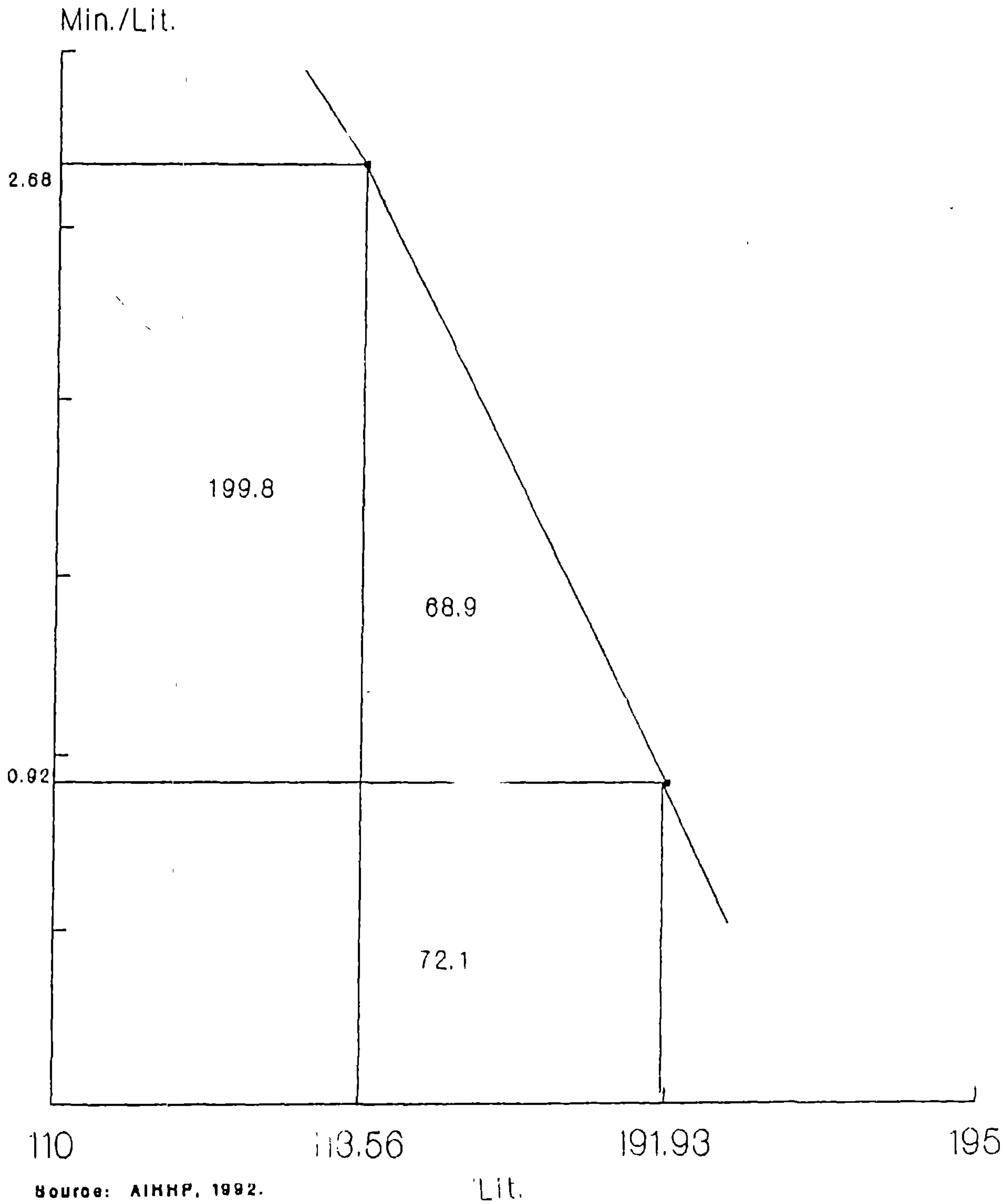
Source: Different Sources.

7.13 Improvements in RWSS have resulted in reduced water collection time for women and increased water consumption. The AIIHP (1992) study report households consumed about 19 lcd before project implementation. Higher water consumption in the hills may be due to inclusion of water hauled for livestock watering and bathing/washing. After implementation per capita consumption increased to 32 lcd. Increased water consumption is used primarily for bathing, washing and livestock maintenance activities with implications for hygiene and sanitation.

7.14 In the hills average water consumption per household before improved water supplies was 113.56 liters per day. The average time spent in fetching water was 304.4 minutes per day and time cost of water collection was 2.68 minutes per liter. With improved water supply household consumption increased to 191.93 liters per day, and time spent for water collection reduced to 177.72 minutes per day. Therefore time cost of water collection after project implementation is 0.92 minutes per liter.

7.15 Time savings associated with initial level of water consumption i.e. 113.56 liters per household per day is about 199.8 minutes and benefits from increased consumption of water is about 68.9 minutes. In the hills total time savings benefit from improved water supply (gravity scheme) is estimated at 268.7 minutes per day or 4.478 hrs per household per day. Figure 7.1 depicts time demand for water before and after improved water supply. Elasticity of water demand is estimated at -0.5 which is consistent with established elasticities of -0.2 to -0.7.

Figure 7.1: Time Savings Benefit from RWSS in the Hills (Gravity Scheme)



Source: AIHHP, 1992.

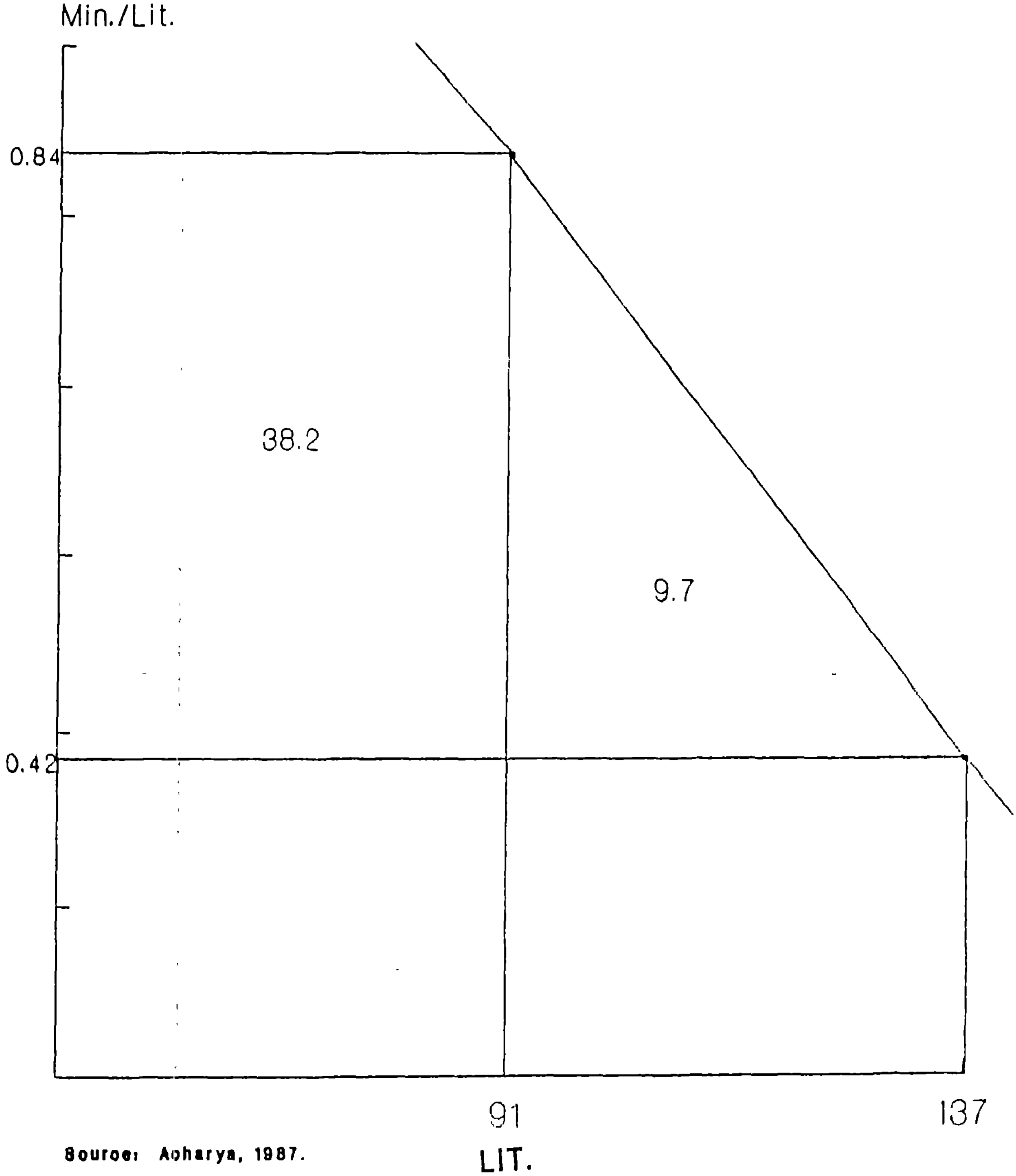
7.16 In the terai time cost of water collection before intervention was 0.84 minute per liter (Archarya, 1987). With improved water supply (tubewell scheme) time cost of water collection is reduced to 0.42 minute per liter. Time savings associated with initial level of water consumption i.e. 91 liters per household per day is about 38.2 minutes and benefit from increased water consumption is about 9.7 minutes. In the terai total time saving benefits from improved water supply (tubewells) is estimated at 0.8 hr per household per day. Figure 7.2 depicts time demand of water before and after improved water supplies. The estimated elasticity of demand for water is -0.6 which is anticipate since alternative sources are more likely to be available in the terai th in the hills.

7.17 Value of Time Savings. Studies demonstrate time saved from improved water supply is used mainly in farming activities, livestock maintenance, household maintenance (including childrearing) and sleeping. The evaluation of NRCS drinking water project (HSC, 1992) concludes that as much as 38% of time saved is used in income generating activities, farming and livestock maintenance. The AIHHP study (1992) estimates 30% of time saved is used for economic activities such as farming, livestock maintenance and cottage industries. Another 16% of time saved is used in household productive activities such as childrearing, housekeeping and kitchen gardening. The remaining time saved is used in non-economic activities such as sleeping, playing and socializing.

7.18 For economic analysis the value of time saved is derived from proportions of time saved used in economically productive and non-productive activities (AIHHP, 1992). Economically productive activities such as farming, livestock maintenance and cottage industries have been valued at prevailing economic wage rates for women in rural areas as of January 1993 (i.e. NRs 40 per day for 8 hrs of work). Although rural wage rate tend to vary depending upon the nature of work, gender and nearness to urban centers, field visits to Kavre (hill), Lumbini (terai) and JAKPAS project sites indicate wage rate at NRs. 40 per day (or NRs. 30 per day plus afternoon snack worth NRs. 10) is consistent with wage rate for farm labor during normal seasons. During the peak farming season and for labor involved in digging, trenching etc. wage rate are higher (about NRs. 60 per day). Thirty percent of time saved used for economic activities is valued at full economic wage rate. Another 16% of time saved is used in household productive activities such as housekeeping, kitchen gardening, and child rearing and have been valued at 50% of economic wage rate (similar valuation is done in SriLanka (World Bank, 1992). The remaining 54% of time saved is used in non-economic activities such as sleeping, playing, socializing etc. which provide convenience benefits leading to improvements in the quality of life. These benefits have been valued at 25 percent of economic wage rate. Such valuations have been justified in transportation studies as well.

7.19 At January 1993 prices the estimated value of time saved for gravity schemes (in the hills) is NRs. 11.53 per household per day including benefit worth NRs. 2.96 from increased water consumption. Assuming 6 persons per household in the hills the estimated annual per capita benefit from time saved is valued at NRs. 701. Similarly for terai tubewell schemes total time savings benefit is valued at NRs. 2.06 per household per day or NRs. 125 per capita per year assuming an average household size of 6.

Figure 7.2: Time Savings Benefit from RWSS in the Terai (Tubewell Scheme)



Source: Acharya, 1987.

2. Benefits from Energy Savings

7.20 New water supplies are designed to ensure that users would have more convenient access than their previous supply. Convenient access would have the effect of significantly reducing effort and energy expended in hauling water for household maintenance. An alternative to measuring time saving benefits is to assess savings in energy expended through time savings from rural water supply projects.

7.21 The AIIHP (1992) study investigates the relationship between energy saved in hauling water and improvements in health conditions of women. Women in rural areas suffer more from malnutrition, anemia and loss of energy due to their heavy work load of which fetching water constitutes a major task. Water hauling tasks are reported to result in stunted growth and development of children. Loss of energy from water hauling is directly related to depletion in health conditions of women who already suffer from inadequate nutritional intake. The study estimates average energy expended by a household to haul 113.56 liters of water to be 590 K cal per day in the hills. This implies energy cost of hauling water was about 5.2 K calorie per liter before the water supply. With improvements in water supply, energy expended by a household in collecting 191.93 liters of water is estimated at 238 K cal per day. Energy cost of hauling water is reduced to 1.24 K calorie per liter after improved water supplies.

7.22 Benefits of energy savings occur from reduced cost of energy in hauling water at the previous level, and energy savings in consumption of additional water i.e. a measure of consumer surplus. Figure 7.3 illustrates total benefit from energy savings and energy demand for water before and after the project. Total benefit from energy savings is estimated at 604.9 K cal per household per day.

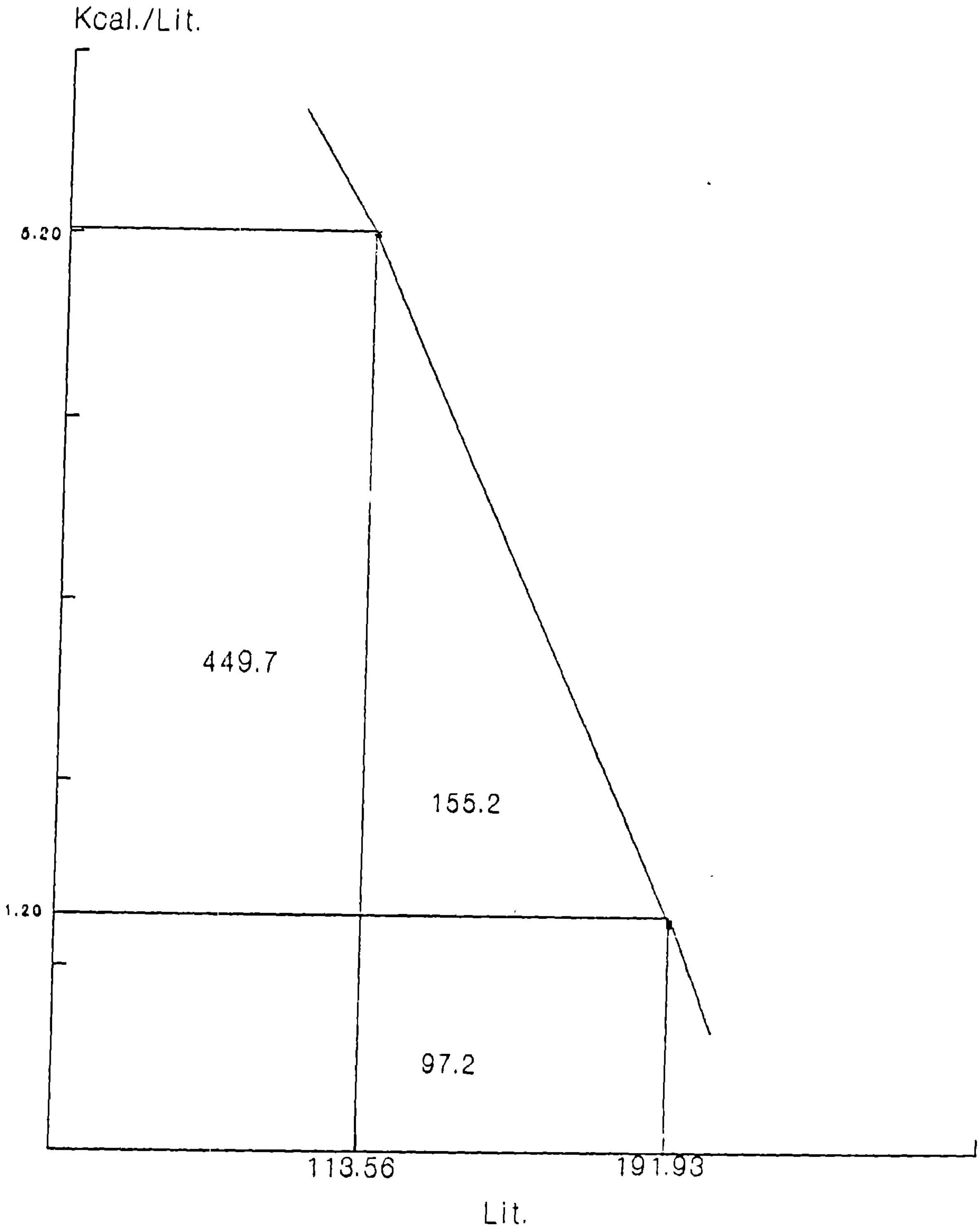
7.23 Value of Energy Savings. The Basic Needs Program (1985) estimates required daily allowance at 2250 K calorie per person (rural areas). Income required to maintain this diet is estimated at NRs. 200 per capita per month (World Bank, 1990). At January 1993 prices, income required to meet a diet of 2250 K cal per person per day is NRs. 498 per capita per month. This implies the imputed value of 604.9 K cal energy saved per household per year is about NRs. 1606 or NRs 267 per capita per year assuming 6 persons in a household.

7.24 From the above analysis, although time saving and energy saving benefits may not be additive, energy saving benefit accounts for 38% of estimated benefit from time savings. Therefore, it can be concluded even when there are no economic opportunities in rural areas to realize the full benefit of time saved there exist convenience benefits associated with energy savings. This has a direct bearing on women's health and girl children. Benefits from energy savings may be considered as a surrogate measure of health and convenience benefits.

3. Health Benefits

7.25 In addition to time benefits, there are direct health benefits from improved water quantity and quality. Lack of data and serious errors in measurement makes it difficult to quantify health benefits. There is however, increasing evidence that improved water supply and sanitation contributes to

Figure 7.3: Energy Savings Benefit from Water Supply



Source: AIHHP, 1992.

better health by reducing diarrheal morbidity and mortality (Esrey et al. 1985). Morbidity and mortality from water borne diseases in Nepal is very high. As much as 140 thousand children under 5 years die each year of diarrhoea and dehydration. The incidence of water-fecal diseases such as diarrhea, dysentery, typhoid, round worm, scabies and sore eyes have to some extent been reduced with improved water and sanitation services (HSC, 1992). Similar statements were made by the communities during the consultant's field trips to Kavre, Kaski and Lumbini. The persistence of water borne diseases in the rural areas imply that mere provision of improved water and sanitation facilities will not improve the health conditions of people unless reinforced by a well integrated hygiene and sanitation education (see chapter IV para 4.26-4.27).

7.26 The only study undertaken in Nepal to assess behavioral and health aspects of sanitary intervention (Acharya, 1987) concludes that tubewell program in the eastern terai district have improved the quantity and quality of drinking water and has reduced water borne diseases significantly. The study documents substantial reductions in the occurrence of diarrhea and worm infestation among children 6 to 72 months as a result of water supply interventions (Table 7.2).

Table 7.2: Prevalence of Water Related Diseases and Worm Infestation Among Children 6 to 72 Months in Eastern Terai District of Nepal

Disease	Before Intervention %	After Intervention %
Trachoma	2	1
Conjunctivitis	30	20
Scabies	6	5
Diarrhoea	53	33
Hookworm Infestation	54	35
Roundworm Infestation	76	54

Source: Acharya, 1987.

7.27 Diarrhea among children 6 to 72 months is reduced by as much as 20 percent. In Nepal the leading cause of child morbidity and mortality is water borne and water related diseases. The above data shows that health and hygiene benefits of water supply and sanitation are more significant in the terai.

7.28 Value of Health Benefits. One way of measuring health benefits of RWSS is to estimate the cost of sick time lost or to impute savings in cost of treating water related diseases due to poor water supply. This can be determined from annual reduction of disease episodes and the unit cost of treatment for each episode. Such data, to our knowledge, do not exist in Nepal and hence efforts to quantify health benefit is not attempted. Furthermore many of the diseases such as worm infestations and skin or eye diseases often go without medical treatment. Treatment savings would be gained only for those cases where complications lead to hospitalization and or treatment (WHO, undated). Households in the terai report reduction in treatment costs from as much as NRs. 500 to NRs. 1000 per capita per year. Existing data on health benefits from improved water supply although limited, clearly indicates significant reduction in water related diseases and infections that have consequences for morbidity and mortality of children and women. This indicates the magnitude of health benefits that can be realized from improved water supply and sanitation which may very well surpass the value of time benefits in the context of rural Nepal.

B. Cost of RWSS Services

1. Capital Cost

7.29 Cost of water supply scheme is built from the cost components for material, porterage, labor (skilled and un-skilled), transportation, technical assistance for design, supervision and overhead for each technology type (see chapter IV section D for details). Accordingly, per capita cost of gravity and spring protection are estimated at NRs. 1157 and NRs. 455 respectively for schemes with present population of 300. Similarly per capita costs of shallow tubewell, deep tubewell and dug wells are estimated at NRs. 204, NRs. 1275 and NRs. 850 respectively with a present population of 600. The economic analysis also includes cost of sanitation (demonstration latrine) and catchment protection for gravity and spring protection schemes.

2. O&M Cost

7.30 The MITS study (1990) estimated average annual maintenance cost at 2% of capital cost. Binnie & Partners project preparation study (1990) estimated cost of routine operation and maintenance at about 2.7% of capital cost for gravity schemes, and 1.78-2.27 for tubewell schemes excluding labor. These estimates are basically for routine operation and maintenance and does not cover major repair and maintenance that would occur during the life of a system.

7.31 Allowing for such major repairs O&M cost estimates for RWSSP are built from norms adopted in the MITS and Binnies' studies. The unit O&M cost estimate is presented in Annex Table 91. It is estimated that 3% of capital cost would be required for annual O&M cost of gravity schemes (Annex Tables 88-89). However, depending upon scheme type it may vary from 2% to 4% of capital cost. During the early stages of project implementation O&M cost would be minimum but with the passage of time it would increase gradually. Community must be made aware of this and encouraged to make an adequate annual contribution to O&M towards a revolving fund.

7.32 The estimated annual cost of O&M for RWSSP tubewell schemes is about 4% of capital cost (Annex Table 92). Regular O&M cost may be lower since replacement of nuts and bolts, washers and valves cost less. However, handle, pump head and platform repairs cost much more. The cost may vary from 1.8% to 5% of capital cost depending upon scheme type. Annual O&M cost for spring protection system containing 1 spring intake, 1 reservoir of 1 cu m. (required when yield is extremely low), 1 Km. pipeline and 1 tapstand is estimated at about 4% of capital cost (Annex Table 90).

7.33 Sustaina. lity of schemes depend largely upon the availability of sufficient funds for ·, and repair. The estimated O&M and repair costs for different schemes a presented in Table 7.3. At present no data on actual O&M costs exist. It is recommended that JAKPAS supported study on O&M cost generate such data in time for RWSSP implementation.

Table 7.3: Estimated O&M Costs for Different Water Supply by Schemes

System	Capital Cost Per Scheme (In NRs.)	Annual O&M Cost @ 3% of Capital cost (In NRs.)	Annual O&M Cost @ 4% of Capital Cost (In NRs.)	Per Capita Annual O&M Cost Requirement (In NRs.)
Gravity Schemes	347100.00	10413.00		34.71
Shallow Tube Well	122400.00		4896	8.16
Deep Tube Well	765000.00	22950.00		38.25
Dug Well	510000.00	15300.00		25.50
Spring Protection	136500.00		5460	18.20

Source: Consultant's Estimate.

7.34 For economic analysis, O&M and repair at 3% of capital cost is used for gravity flow, deep well and dug well. For shallow tubewell and spring protection 4% of capital cost is used.

7.35 Cost of software components is built from norms used for staff requirements (see chapter VI Table 6.13-6.14), material, technical support and overhead by different agencies implementing RWSS (see chapter IV for details). Software cost includes the cost of community mobilization, hygiene and sanitation education including trainings, NFE, VMW training, WUC training, mason training and women's skill enhancement training for all schemes (see chapter IV for details). NFE is included in only 50% of communities (see chapter IV para 4.54-4.56). Estimated per capita software costs for gravity, shallow tubewell, deep tubewell, dug well and spring protection are NRs. 467, NRs. 306, NRs. 305, NRs. 305 and NRs. 467 respectively.

C. Benefit/Cost Analysis

7.36 Basis for Economic Analysis. Economic analysis of water supply and sanitation projects and RWSS Project as a whole is carried out using the Program Budgeting of the Ministry of Finance (MOF) and the IDA (World Bank) methods.

1. MOF Program Budgeting Method

7.37 The Program Budgeting Manual (1989) of the Ministry of Finance provides guidelines on procedures for economic analysis of development projects. The method uses discounting costs and benefits to present value. Opportunity cost of capital is used at 15%. Economic cost and benefits are derived from financial costs and benefits. Financial costs are converted using shadow price factors recommended in Program Budgeting Manual as follows:

Shadow Price	Factor
Foreign Exchange	1.20
Unskilled Labor	0.75
Skilled Labor	1.00
Other Items	1.00

The cut-off ERR for an acceptable project is 15% (Annex Table 101).

2. IDA (World Bank) Method

7.38 The IDA method expresses all prices into "Border Prices". Accordingly all domestic costs and benefits are factored at 0.9 of nominal price. The cut-off ERR for an acceptable project is 10% (Annex Table 100).

7.39 Benefits and costs of each type of water supply scheme have been forecasted over a 20 year horizon for gravity and spring protection schemes (hill) and 15 years for w 'l schemes in the terai (where population growth is more than 3%) at January 1993 border prices. Border prices are calculated using the Standard Conversion Factor of 0.9 for domestic costs and benefits. Opportunity cost of capital is used at 10 percent. The MOF method is likely to assess benefits more conservatively than the IDA method. On the other hand local costs (especially labor and material) are undervalued while capital is overvalued under the MOF method.

7.40 Tables 7.4 and 7.5 present summary of Benefit/Cost ratios and ERRs for base case and percentage change in base case costs and benefits under IDA and MOF methods respectively. The analysis also includes estimates of Benefit/Cost ratios and ERRs for all water schemes and for each scheme type eg. gravity and well systems. The Benefit/Cost analysis of RWSSP as a whole is also carried out. Benefit/Cost analysis are also carried out under different scenarios with percentage change in benefits and costs to test for sensitivity.

7.41 Comparison of time saving benefits with direct cost of water schemes (including community level software, design and supervision, support organization overhead, and hardware) for all water schemes combined yields estimated Benefit/Cost ratio of 2.99 and the ERR of 37.2% under the IDA method. Under the MOF method estimated B/C ratio and the ERR are 2.31 and 38.0% respectively. High ERRs suggest economic viability of sub-projects. Sensitivity tests suggest robustness of the estimates. Only when the benefits decrease by more than 30% and costs increase by more than 30%, the expected economic rate of return (for all water schemes combined) falls below the acceptable ERR under MOF method.

7.42 Similarly economic rates of return under the IDA method for gravity (Annex Table 95), hallow tubewell (Annex Table 96), dug well (Annex Table 98) and spring protection (Annex Table 99) are 42.7%, 28.2%, 9.2% and 11.3% respectively. High ERRs on shallow tubewells compared to other technologies relate to lower per capita costs of shallow tubewells compared to other well schemes.

Table 7.4: Summary of Benefit/Cost Ratios and ERRs Under IDA Method

Scenario	B/C Ratio	ERR
Base Case All Water Schemes	2.99	37.2
Base Case All Water Schemes (excl.software)	3.91	51.1
Base Case RWSS Project	2.13	24.5
Gravity Scheme		
Base Case	3.43	42.7
Cost up 20%	2.86	35.5
Benefit down 20%	2.74	34.0
Cost up 20% & Benefit down 20%	2.29	28.1
Shallow Tubewell		
Base Case	2.21	28.2
Cost up 20%	1.85	23.2
Benefit down 20%	1.76	22.0
Cost up 20% & Benefit down 20%	1.47	17.7
Deep Tubewell		
Base Case	0.67	3.3
Cost up 20%	0.56	0.5
Benefit down 20%	0.54	-0.1
Cost up 20% & Benefit down 20%	0.45	-2.8
Dug Well		
Base Case	0.96	9.2
Cost up 20%	0.80	6.1
Benefit down 20%	0.76	5.4
Cost up 20% & Benefit down 20%	0.64	2.5
Spring Protection		
Base Case	1.08	11.3
Cost up 20%	0.90	8.3
Benefit down 20%	0.86	7.7
Cost up 20% & Benefit down 20%	0.72	5.1
Sensitivity Tests - Water Schemes		
Investment Cost up 20%	2.50	30.9
Benefit down 20%	2.39	29.5
Benefit down 20% Cost up 20%	1.99	24.3
Sensitivity Tests - RWSS Project		
Cost up 20%	1.77	20.4
Benefit down 20%	1.70	19.5
Cost up 20% Benefit down 20%	1.42	15.9

Source: Consultant's Estimate.

Table 7.5: Summary of Benefit/Cost Ratios and ERRs Under MOF Method

Scenario	B/C Ratio	ERR
Base Case All Water Schemes	2.31	38.0
Base Case All Water Schemes (excl.software)	3.08	52.6
Base Case RWSS Project	1.60	24.9
Gravity Scheme		
Base Case	2.67	44.0
Cost up 20%	2.22	36.5
Benefit down 20%	2.13	35.0
Cost up 20% & Benefit down 20%	1.78	29.0
Shallow Tubewell		
Base Case	1.72	28.4
Cost up 20%	1.44	23.4
Benefit down 20%	1.37	22.2
Cost up 20% & Benefit down 20%	1.15	18.0
Deep Tubewell		
Base Case	0.50	2.5
Cost up 20%	0.41	-0.3
Benefit down 20%	0.40	-0.9
Cost up 20% & Benefit down 20%	0.33	-3.5
Dug Well		
Base Case	0.74	9.2
Cost up 20%	0.62	6.1
Benefit down 20%	0.59	5.3
Cost up 20% & Benefit down 20%	0.49	2.5
Spring Protection		
Base Case	0.84	11.9
Cost up 20%	0.70	8.9
Benefit down 20%	0.67	8.3
Cost up 20% & Benefit down 20%	0.56	5.6
Sensitivity Tests - All Water Schemes		
Investment Cost up 20%	1.93	31.6
Benefit down 20%	1.85	30.2
Benefit down 20% Cost up 20%	1.54	24.9
Sensitivity Tests - RWSS Project		
Cost up 20%	1.33	20.7
Benefit down 20%	1.28	19.8
Cost up 20% Benefit down 20%	1.06	16.1

Source: Consultant's Estimate.

7.43 Economic rate of return on gravity scheme is the highest because of higher time saving benefits compared to tubewell schemes. Deep tubewell schemes do not seem to be economically viable (ERR is less than 4%). For this, time benefits alone would not justify the cost of investment. Such schemes would have to be justified from health and hardship considerations.

Cost of deep tubewell seems rather high to be economically viable. Low cost drilling or well-sinking methods need to be investigated. Dug well schemes are more vulnerable to increases in cost and decreases in benefits. When cost is increased by 20% and benefit is decreased by 20% it is not economically viable (Annex Table 97).

7.44 Estimated Benefit/Cost ratio for RWSSP as a whole (when all other costs such as, Fund establishment, and studies are included) under the IDA method is 2.13 with ERR of 24.5% while it is 21.9% under the MOF method. Only when cost is increased by more than 30% and benefits are reduced by more than 30% the economic rate of return of RWSSP as a whole falls below the acceptable rate of 10% under the IDA method and 15% under the MOF method.

7.45 Given the partial measure of benefits and the robustness of the ERR with respect to substantial differences in benefits and costs, it can be concluded that RWSSP would yield larger economic benefits than cost. This is nonetheless, subject to rigorous adherence to the proposed scheme design and selection criteria.

D. Economics of Design and Service Options

7.46 In order to provide community with choices, economic analysis of different design and service options is undertaken for gravity and tubewell schemes.

1. Gravity Scheme.

7.47 A typical gravity scheme with transmission and distribution pipe length of 3.5 km and other features similar to the one recommended for RWSSP (Annex Table 44) is considered (see Annex Table 75-77 for design). Cost of a scheme providing 45 lcd is estimated at NRs. 378280. The estimated time savings benefit assuming 32 lcd consumption at round trip 10 minutes (300 meters) is NRs. 241632. The expected economic rate of return (IDA method) is 47 percent.

7.48 If the service level is reduced to 25 lcd, scheme cost is reduced by about 11% (19% reduction in pipe cost and 29% reduction in reservoir). For details refer Annex Tables 79-80. Benefits from reduced water supply would decrease by about 23% resulting in ERR of 39 percent (Table 7.6). Similarly when the number of taps is decreased to 5 (i.e. 10 households per tap), scheme cost is reduced by about 6% and benefits from time savings is diminished by 13% at 45 lcd service level. When the service level is reduced to 25 lcd and the number of taps are decreased to 5, scheme cost is reduced by 13% and the benefits are reduced by about 24%. Likewise an additional tap would increase the scheme cost by 3% and reduce the benefit by about 6%. An additional private tap would reduce the cost by about 5%. Preliminary analysis indicates optimal service option to be 45 lcd with 6-7 households per tap.

Table 7.6: Design and Service Level Options for Gravity Scheme

No. Tap	HH/Tap	Lcd	Design Period Yrs	Cost NRs.000	Benefit/Yr NRs.000	ERR
7	7	45	20	378.3	241.6	47.1
7	7	25	20	338.0	184.6	39.2
7	7	45	15	374.1	241.6	47.1
5	10	45	20	355.6	209.8	42.8
8	6	45	20	390.0	254.9	48.4
8	7+1*	45	20	398.1	241.6	45.5

* One private connection

2. **Tubewell Scheme.**

7.49 In the terai tubewell schemes are designed for 15 years, present population at 600 (100 households) with about 12 hh/per shallow tubewell. Other specifications are as described in (Annex Table 45). Scheme cost is estimated at NRs. 122400 and the estimated economic rate of return is about 27 percent. Alternatively when the scheme is designed with 13 shallow tubewells (one shallow tubewell per 8 households) estimated ERR is 25 percent and with 20 shallow tubewells (one shallow tubewell for 5 households) ERR is reduced to about 21 percent (Table 7.7).

Table 7.7: Design and Service Level Options for Tubewell Scheme

Design Period	HH/Tubewell	No. Tubewell	B/C Ratio	ERR
15 Yrs	12	8	2.26	26.7
15 Yrs	8	13	2.08	24.7
15 Yrs	5	20	1.81	21.5
10 Yrs	14	7	2.11	25.5
20 Yrs	20	5	1.44	17.1
20 Yrs	20	5+5*	1.61	19.8
20 Yrs	20	10	2.22	26.2

* Five tubewells now and 5 tubewells after 10 yrs.
Source: Consultant's Estimate

7.50 Similarly when tubewell schemes are designed for 10 years with a service level of one shallow tubewell per 14 households (present households), the estimated ERR is about 26 percent. Likewise if tubewell schemes are designed for 20 years with one tubewell per 10 households (present) the estimated ERR is 26 percent. When the service level is reduced to more than 20 households per tubewell, the scheme does not seem to be economically viable. Comparing a scheme built with 5 tubewells (present) and 5 added after 10 years to a scheme built with 10 tubewells (present) the former would be cheaper since the present value of the real cost is less but the latter yields higher economic rate of return. From the above analysis it seems that designing terai tubewell schemes for 15 years with a service level of one tubewell per 12 households at present would be economically optimal.

E. Willingness to Pay

7.51 Community willingness to pay for improved RWSS is contingent upon many factors besides income. Predominant considerations are perceived benefits, household characteristics, convenience (level of service), reliability and perceived quality of existing and proposed water supplies. Women more than men would be willing to pay for the services (see chapter IV section B).

7.52 Willingness to pay for RWSS is difficult to assess from surveys which ask directly how much communities are willing to pay for the services. Direct questioning would grossly under-report community willingness to pay. A more appropriate but indirect way of assessing demand is to gather information on community water use practices and desired service level. A combination of direct and indirect methods of assessing willingness to pay has in recent years been recommended. A number of studies have tried to assess willingness to pay for RWSS services (Table 7.8).

Table 7.8: Willingness to Pay Estimates (NRs per hh per month)

	Report		1993 price	
	Average	High	Average	High
MITS (1990)	6	20	8	28
Binnie & Partners (1990)	6	21	8	29
SASCON (1992)	5	15	6	17
Cowi Consult (1988)	5	20	8	34

Source: Different Sources.

7.53 A socio-economic survey of 20 villages conducted by MITS in 1990 indicates community willingness to pay NRs. 6-20 per household per month. More than 80% of the community indicated NRs. 10 per household per month as acceptable tariff as long as adequate water supply is provided. A similar study conducted by Binnie and Partners (1990) in connection with World Bank funded project preparation activity for 80 new rural water supply schemes estimates community willingness to pay at NRs. 6-21 per household per month. The study concludes that it is reasonable to increase the stated level of willingness to pay to allow for people's natural reluctance to commit to a definite figure. It is very likely that stated willingness to pay would be lower than true demand for the service.

7.54 The study by Cowi Consult (1988) conducted in 6 districts indicates more than 50% of the people are willing to pay NRs. 5-20 per household per month. People are willing to pay more for household connections. Another study conducted by SASCON (1992) in 23 communities in the hills, terai and mountains also conclude that households are willing to pay NRs. 5-15 per month for operation and maintenance. The study indicates that communities would be willing to pay more for uninterrupted service than is the case with DWSS implemented systems.

7.55 Field visits to Kavre, Kaski and Lumbini confirm willingness to pay and contribute where real need is demonstrated. Households are found to pay more than what is being required by most agencies providing water supply services. Most households are willing to pay NRs. 15-20 per month if water supply is reliable. Field visits confirm that community willingness to pay is directly related to perceived benefits, real need and reliability of service. If communities are made aware of all the potential benefits of RWSS they are willing to contribute more for the service. Willingness to pay in our view, is not an issue where there is felt need. Communities report contributing upfront NRs. 100-200 per household (in some cases as high as NRs. 500) towards a "future maintenance fund" in addition to a minimum NRs. 5-10 per household per month and grain equivalent to NRs. 20-40 per year to cover regular operation and maintenance costs.

7.56 These estimates indicate communities are willing to pay about NRs. 8-30 per household per month at 1993 prices. Since willingness to pay for water supply depends largely upon perceived needs, benefits and reliability of services a comprehensive study to assess willingness to pay to determine demand for different service levels and technology options needs to be undertaken during the JGFFT project and RWSSP implementation.

7.57 Our estimates of benefits from time savings due to improved water supply indicate households receive additional benefits equivalent to about NRs. 2 per household per day in the terai and NRs. 11 per household per day in the hills. Assuming people would be willing to pay at least 10% of the benefits of improved water supply, willingness to pay would be NRs. 6-33 per household per month, which is less than 3-5% of income for the lowest decile. In our opinion this would be a realistic measure of demand in view of the low elasticity of demand for drinking water which is estimated at -0.2 to -0.7 (World Bank, 1993).

7.58 Willingness to pay would be higher among some members of the community and would also differ for different service levels. Households desiring higher service levels would be allowed to do so provided they pay 100% of the incremental costs for improvements over the standard service level. Field visits indicate that some households would demand higher service levels (i.e yard connection). Allowing higher service to households who would pay 100% of the incremental cost over and above the delivery of standard service level would provide additional reources to the community which could be used to cross-subsidize households that are unable to make cash contributions.

F. Community Contribution

7.59 As in most developing countries cost recovery in water supply and sanitation is a recurring issue. Cost recovery is a new policy introduced by NGOs implementing RWSS schemes with community participation in which users contribute towards capital and operation and maintenance costs of the scheme. Cost recovery policy is justified from both efficiency and equity considerations. When users contribute little or nothing to the service there is substantial inefficiency in resource allocation (i.e. wastage and misappropriation) and use (i.e. services do not meet user preferences).

Similarly when government is limited by resources and users pay very little or nothing, a large part of the population would be under/unserved by the services. Therefore, if community based RWSS is to be sustainable the community must feel ownership towards the scheme and contribute the maximum towards its cost.

7.60 High capital cost, lack of consumer affordability, poor water supply services and the notion that water is a "free public good" have been used to explain political resistance to greater cost recovery. This attitude has rendered most government-run RWSS schemes inefficient and unsustainable. Cost recovery in RWSS is not feasible since communities are too scattered which would make the cost of cost recovery prohibitive. Therefore the policy would be to enable maximum community cost contribution.

7.61 A review of RWSS schemes implemented by various agencies (NGOs and donors) with community participation indicate communities contribute 10-35 percent of capital cost in gravity schemes and 10-26 percent in tubewell schemes including cash, labor and local materials (Table 7.9). Communities are also responsible for 100 percent of O&M cost. The large variation in community contribution depends upon cost recovery policies of different implementing agencies and the degree of community involvement.

7.62 Analysis of component costs of schemes implemented by different agencies indicate that unskilled labor including porterage and local materials comprise 24-59 percent in gravity and 15-19 percent in tubewell schemes. The estimates for the Project are about 30% and 19% respectively (Annex Table 47). Communities are usually willing to contribute all labor (unskilled) and local materials.

1. Capital Cost Contribution

7.63 The Phase I report (East Consult, 1992) suggested a minimum community contribution at 20% of construction cost which is low. Discussions with communities during field visits indicate community willingness to contribute more towards capital and O&M if they are assured of system reliability. Communities also expressed their willingness to contribute 1 or 2 percent of construction costs in cash for gravity and more for tubewell schemes. A community in Kavre (Ugrachandi VDC, Ward 8) raised as much as 55% of the capital cost in cash and additional 17% in labor in a gravity scheme supported by NRCS. Households contributed NRs. 500 up-front towards scheme construction. This clearly indicates real need and realization of benefits of improved water services can generate higher levels of community contributions. Therefore, we suggest RWSSP require communities to contribute all unskilled labor, local materials and porterage and 100 percent O&M costs for all schemes.

Table 7.9: Community Contribution to Capital and O&M Cost of Water Supply Schemes

Agency	Capital (%)	O&M (%)
Gravity Schemes		
UNICEF/DWSS	11	100
FINNIDA/DWSS	22	100
CARE/NEPAL	19	100
LWS	29	100
UMN	17	100
WATERAID	22	100
NFESC	23	100
REDD BARNA	33	100
SAPPROS	35	100
Tubewell Schemes		
FINNIDA/DWSS	10	100
CARE/NEPAL	26	100
NRCS	13	100

Source: Different Sources.

7.64 We believe that requiring communities to contribute minimum 1% of capital cost (gravity scheme) in cash would instil in them a sense of ownership and motivation to seek low cost solutions to their water supply problems. When they are required to make a cash contribution, communities would focus more carefully on appropriate design since cash is relatively scarce in rural communities. Precedents exist for cash contribution in some NGO run programs. Since local material and labor components of tubewell scheme is lower and community affordability is higher in the terai (Table 7.11) total contribution to capital compatible with gravity scheme would be considered, to ensure high commitment to the scheme and to enable RWSSP budget to stretch further equitably. In tubewell schemes communities would be required to contribute minimum 12% cash towards scheme construction (15% of capital cost net of local contribution). Discussions with communities and experience from JAKPAS lend support to requiring a higher cash contribution in the terai. FINNIDA is also currently requiring about 30% community contribution to capital (tubewell schemes).

7.65 No software cost would be financed by communities on grounds that communities would be less able to appreciate the benefits of hygiene and sanitation education than water supplies.

2. O&M Cost Contribution

7.66 When users make a financial contribution to the project they show keen interest in operation and maintenance of the system. They show a higher willingness to pay for operation and maintenance costs and towards scheme improvement.

7.67 Different studies estimate household contribution required to meet O&M costs and suggest a range of rates for cost recovery in O&M. Binnie and Partners (1990) study suggests that medium sized gravity scheme would probably support greater cost recovery, more than O&M. The FINNIDA experience suggests that contributions of NRs. 500 per tubewell and NRs. 1000 per tapstand for operation and maintenance would not be sufficient. Indications are without sufficient community funds for O&M they are likely to return to FINNIDA or HMG for repair and maintenance. Our estimate of construction and O&M costs suggests that existing cost contribution towards O&M are inadequate to sustain the system.

3. Revolving Fund

7.68 A Revolving Fund policy has been introduced by different agencies implementing RWSS to meet the cost of spare parts and periodic repair and maintenance, but the approaches adopted are different (Table 7.10). This policy is important for scheme sustainability and can be used for financing capital and O&M costs of community RWSS through investments in bank deposits, government bonds and even loan to its members. Lutheran World Service requires the community to put up Rs. 500 per handpump for tubewell schemes, and 5 percent of construction cost excluding community contribution for gravity system. United Mission to Nepal requires 5% of capital cost for O&M upfront in a revolving fund. Nepal Red Cross requires communities to deposit Rs. 300 per tubewell and Save the Children/USA collects Rs. 200 per tapstand from the community towards ta Revolving Fund. FINNIDA assisted RWSS schemes require communities to make upfront contribution of Rs. 1000 per tapstand for gravity schemes and Rs. 500 per handpump for shallow tubewell which is deposited in a bank in the user committee's name.

7.69 Differences in revolving fund policies adopted by different agencies have created doubts and uncertainties in communities towards this policy and as a result they tend to be reluctant to bear the cost of construction and O&M. The Revolving Fund policies adopted depend upon the implementing agency and user decisions. However most agencies are requiring a one time upfront contribution of NRs 100-200 (in some cases as much as NRs. 500) and a regular O&M contribution of NRs. 5-10 per month to the revolving fund. The revolving fund is either maintained in a bank or by the WUC from which it earns interest from the fixed deposit or loans are made to the users (in which case it earns a higher interest). The present experience with revolving fund policies of most agencies suggest that contributions towards revolving fund is not adequate. Most communities during our field visit to Kavre indicated they would be increasing the monthly O&M contribution to about NRs. 15-20 per household.

7.70 A more realistic estimate of construction, and operation, repair and maintenance should form the basis for calculating upfront contributions for a revolving fund. Assuming a household size of 6, O&M cost at 3% of capital cost would mean monthly household contribution of NRs 17.35 (gravity), NRs. 19.13 (deep tubewell) and NRs. 12.75 (dugwell). Similarly, O&M cost at 4% of the capital cost would be monthly household contribution of NRs. 4.08 (shallow tubewell) and NRs. 9.10 (spring protection). Accordingly a tapstand with 7 households should raise about NRs. 1460 and a shallow tubewell with 12 households should raise about NRs. 600 per annum. We suggest that 3% of capital cost for gravity, deep tubewell and dugwell and 4% of capital cost for shallow tubewell and spring protection should be collected upfront in a revolving fund for O&M which would be maintained in subsequent years.

Table 7.10: Community Contribution to Revolving Fund

Agency	Revolving Fund Amount
LUTHERAN WORLD SERVICE	Rs. 500 per handpump and 5% of scheme cost contribution of LWS for gravity system.
ACTION AID	Users deposit a minimum amount of Rs 10 per household.
DISVI	Rs 250/tubewell and Rs. 100/tubewell for spare parts. Rs. 100/tapstand for gravity scheme.
NEPAL RED CROSS (NRCS)	No revolving fund in gravity system. Rs 300/tubewell is collected. Fund deposited in bank.
SAVE THE CHILDREN (US)	Users deposit Rs 200/tapstand.
NFESC	Rs 5 to 10/hh/month for schemes with 30-35 hh & Rs 100-200/hh/yr with schemes more households. Rs 50/month/tapstand to pay for caretaker. One caretaker per scheme.
UNICEF	Rs 500/hh in the revolving fund. Spareparts provided by UNICEF & Wages for maintenance workers paid by community.
WATERAID	Rs 300/tapstand for spareparts and Rs 5/hh/month for caretaker.
FINNIDA/DWSS	Rs 1000/tapstand and Rs 500/tubewell.
SAPPROS	Rs 1/hh/month for repair and maintenance

Source: Different Sources.

G. Affordability

7.71 The ability of rural population to pay for RWSS depends upon household income and willingness to pay which heretofore has not been adequately assessed. MITS (1990) estimates affordable tariff based on commonly accepted criteria that households can afford on average 3.5 percent of income for water supply and sanitation services. Binnie and Partners (1990) indicate water supply is affordable if charges do not exceed 3-5 percent of income of the poorest group i.e. bottom and second decile.

7.72 The Multi-Purpose Household Budget Survey (MPHBS, 1988) provides comprehensive data on household income according to which only about 25-33 percent of rural household income consists of cash income (Table 7.11). Rural households could be hard-up for cash but since some of the contributions to operation and maintenance of water supply systems can be made in kind and labor, affordability does not appear to be a major issue for most type of schemes (with the possible exception of deep tubewell). Five percent of cash income or 3 percent of the total household income would be affordable to most rural households. Based on income data from MPHBS (1988) and after adjustment for inflation to January 1993 more than 90 percent of rural households would be able to afford NRs. 12-20 of their cash income per month or NRs. 30-40 of their total income to contribute towards improved water supply.

7.73 Household income varies from community to community. Estimates based on regional average would not reflect true affordability. Each WUC would need to workout an acceptable and more flexible tariff structure depending upon household income levels. A tariff structure that provides cross-subsidy from the wealthier to poorer users who are able to contribute in kind (i.e. material, labor) in lieu of cash is one alternative which WUC members can agree upon. Communities are found to be making such arrangements. If some community members desire higher service level such as house connection, they would be charged a higher tariff. Such arrangements would foster efficiency as well as equity considerations in water supply management.

7.74 Information collected by MITS (1990) in their socio-economic and spot checking surveys of 20 villages indicate more than 80 percent of the communities accept NRs. 10 per household per month as acceptable water tariff if supplies are reliable. Discussions with user groups in Lumbini concurs with the MITS study. A monthly water tariff of NRs. 10-20 per household is affordable to most households in the community.

H. Sustainability

7.75 Sustainability of system and service depends upon availability of adequate funds for operation and maintenance. In rural water supply and sanitation services satisfactory resource arrangements have not been made, especially in DWSS and most NGO implemented schemes. HMG would need to make a clear policy statement to ensure full user responsibility for O&M. Ensuring implementation of even a limited principle of consumer payment of O&M cost would involve changes in past practices.

7.76 Sustainability of scheme would not be assured only by community taking responsibility for operation and maintenance. Communities must be willing to contribute more towards construction investment and feel ownership towards the scheme. This is possible only when communities are empowered to take responsibility for planning, design, construction and maintenance of their water supply system (see chapter IV for details). This would imply transforming users from beneficiaries to consumers and mangers who would take full responsibility of their water supplies.

Table 7.11 Monthly Rural Household Income and Affordable Tariff (NRs.)

Decile	Region	Monthly HH Income*				Affordable Tariff (% of Income)	
						5%	3%
		1985 Cash	1985 Total	1993 Cash	1993 Total	1993 Cash	1993 Total
Bottom 10%	Terai	175	560	435	1395	22	42
	Hill	95	430	235	1070	12	32
	Mountain	155	670	385	1670	19	50
Second 10%	Terai	215	710	535	1765	27	53
	Hill	175	600	435	1495	22	45
	Mountain	240	890	595	2215	30	66
Third 10%	Terai	270	900	670	2240	34	67
	Hill	225	725	560	1805	28	54
	Mountain	315	1065	785	2655	39	80
Fourth 10%	Terai	300	930	745	2315	37	69
	Hill	300	875	745	2180	37	65
	Mountain	315	1090	785	2715	39	81
Fifth 10%	Terai	350	990	870	2465	43	74
	Hill	380	920	945	2290	47	69
	Mountain	340	1125	845	2800	42	84
Sixth 10%	Terai	415	1245	1035	3100		93
	Hill	385	1025	960	2550	48	76
	Mountain	325	1070	810	2665	40	80
Seventh 10%	Terai	465	1305	1160	3250	58	97
	Hill	530	1210	1320	3015	66	90
	Mountain	350	1070	870	2665	43	80
Eighth 10%	Terai	570	1505	1420	3750	71	112
	Hill	550	1415	1370	3525	68	106
	Mountain	470	1300	1170	3240	58	97
Ninth 10%	Terai	775	1790	1930	4460	96	134
	Hill	750	1715	1865	4370	93	123
	Mountain	525	1380	1305	3435	62	103
Top 10%	Terai	1495	2910	3725	7250	186	217
	Hill	1165	2330	2900	5805	145	174
	Mountain	785	1505	1955	3750	98	112

* Figures rounded to NRs. 5

Source: MPHBS, 1988. The Nepal Rastra Bank.

7.77 Sustainability of community-based RWSS is enhanced by requiring upfront community contribution to system operation and maintenance. Such a practice would motivate users to focus on smaller and more manageable schemes rather than large schemes such as those favored by DWSS. More meaningful participation by communities in making decisions on issues of service level, technology choices, sitings, modes of service delivery options and maintenance would improve sustainability of services.

7.78 Scheme-specific charging policy for rural water supply would be a more effective method for ensuring sustainability. The present practice of most community schemes is to collect funds ad-hoc and to maintain a small fund. A more regular system of charges should be encouraged to allow generation of surpluses in the early years to help cover higher expenditures as the system ages.

I. Equity

7.79 Certain members of the community especially the ultra poor and marginal farmers may not be able to bear the full cost of water supply. In such cases communities would have to devise a cross-subsidy system from the rich to the poor and ensure availability of minimum service to the group in return for in kind or labor contribution. One way of doing this would be to allow for households desiring higher service levels i.e. house connection to pay full additional cost and generate additional tariff to subsidize disadvantaged group within the community. In no circumstances, disadvantaged section of the community would be excluded from water supply and sanitation services.

7.80 There is efficiency and equity considerations for subsidy of capital cost of rural water supply and sanitation over and above the health issues due to heavy transaction cost of a system to recover capital charges from rural communities over time for such lumpy investments. However subsidies would have to be properly targeted. The case for subsidy would be more convincing if economic benefits of specific schemes are better understood and are quantifiable as perceived by the communities themselves in terms of sacrifices they are prepared to make.

7.81 Given the very unequal distribution of income in Nepal, there is probably an equity case to subsidize rural water supply and sanitation. Under the circumstances, charging substantially more to consumers with better service (urban or rural) would probably improve efficiency, sustainability and equity.

J. Economic and Sustainability Criteria

7.82 As stated in the TOR (Appendix A) all water supply and sanitation schemes in addition to other criteria, would be selected based on economic viability and sustainability (see chapter IX).

1. Economic Criteria

7.83 Economic viability of sub-projects would consider cost of RWSS per capita are below or does not exceed agreed ceiling or that benefits exceed costs where achieving certain standards implies higher costs; and demonstrated community willingness to contribute to scheme cost and pay for operation and maintenance.

7.84 *Maximum Scheme Cost Per Beneficiary.* Based on estimates of economic costs and benefits of different schemes, ceilings for maximum per capita cost of scheme (including cost of construction, design and supervision) that would be economically viable have been derived (Table 7.12).

Table 7.12: Maximum Cost Per Beneficiary for Different Schemes

Scheme Type	Present Population /scheme	Maximum Cost per capita
Gravity Schemes	300	NRs. 1312
Spring Protection	300	NRs. 546
Shallow Tubewell	600	NRs. 244
Dug Well	600	NRs. 1020
Deep Tubewell	600	NA

Source: Consultant's Estimate.

7.85 The above estimates on maximum per capita are derived from Benefit/Cost analysis of water supply schemes with design standard and service levels proposed for RWSSP. A benchmark of B/C=1.5 is used to justify for RWSSP viability to allow for risk and uncertainty which may arise from differences in assessment of actual costs and benefits. If schemes involve higher per beneficiary cost, either the design would need to be revised to achieve cost standards or it will need to demonstrate that economic benefits exceed scheme cost in excess of 1.5:1. Communities would be required to contribute 100% of the incremental scheme costs for improvements over the standard service level.

2. Sustainability Criteria

7.86 In order to ensure sustainability of water supply schemes, the following criteria are suggested for scheme selection:

(a) communities would be required to contribute all unskilled labor, local materials and porterage which would result in communities contributing 25%-50% of the cost of gravity schemes and 15%-20% of the cost of shallow tubewell schemes.

(b) communities would be required to contribute minimum 1% of hardware, design and supervision costs in cash for gravity and spring protection schemes. Since tubewell scheme offer limited opportunities for in-kind contribution, a minimum 15% of hardware, design and supervision costs in cash contribution would be made in shallow tubewell schemes to ensure higher commitment and to enable the budget to stretch further.

(c) communities would be required to make upfront contribution of 3% of capital cost in gravity, dugwell and deep tubewell schemes and 4% of capital cost in shallow tubewell and spring protection schemes in a revolving fund for O&M which would be maintained in subsequent years.

K. Additional Research and Data Required

7.87 Although it is desirable to have more reliable data and information, the framework presented in the analysis can be implemented. Additional research on economic, social, institutional and technological issues would provide useful insights to policy makers. Research needs are identified in the following areas:

(a) one obvious area for research is developing a better understanding of the factors that determine demand for water and sanitation services. This would facilitate better assessment of demand and willingness to pay for different levels of RWSS services;

(b) one of the controversial issues surrounding linkages between RWSS investments and health is not so much a justification for improvements but of determining the role of water supply and sanitation improvements in health programs. Given the existence of some level of water supply there is a need to look at how and in what ways hygiene and sanitation program would contribute to improvements in health and the circumstances in which such benefits are realized. Research is needed in this area since very little information exist pertaining to experiences in Nepal;

(c) no data exists on actual cost of O&M for different RWSS schemes making it difficult to recommend a specific policy for cost contribution. A survey to assess cost recovery policies adopted by different communities under different conditions would improve the chance for a reasonable degree of cost recovery; and

(d) research on low cost labor intensive technologies allowing different design standards and specifications would provide service delivery options to communities rather than delivering a standard level of service.

VIII. ENVIRONMENTAL IMPACT ASSESSMENT

8.1 The proposed RWSS Project would implement a total of 900 water supply schemes. In the hills 642 gravity schemes and 33 spring protection schemes for a population of 300 would be constructed to benefit 0.2 million population. Similarly in the terai 183 shallow tubewells, 21 deep tubewells and 21 dugwell schemes for a population of 600 would be constructed to benefit 0.13 million population. It is anticipated that in the first year of implementation, 89 gravity schemes (26700 population) and 5 spring protection scheme (1500 population) benefiting 28200 population would be built in the hills. Similarly 25 shallow tubewell schemes (15000 population), 3 deep tubewell schemes (1800 population), and 3 dugwell schemes (1800 population) benefiting 18600 population would be built in the terai. Each year thereafter, 50, 75 and 100 more schemes are likely to be added.

8.2 Rural water supply and sanitation projects, in general, do not have significant adverse environmental impacts due to their small size although their cumulative effect can be substantial. Proper planning, design and implementation of schemes can considerably mitigate negative effects. Analysis of environmental impact is necessary to minimize likely negative impacts. Initial environmental screening within World Bank guidelines indicated that this would be a category B project. In light of this likely impacts from RWSS sup-projects are carried out and mitigation measures for negative impacts suggested.

A. Positive Environmental Impacts

8.3 Provision of safe and reliable water supply closer to the household, improved environmental sanitation and integrated hygiene and sanitation education would have a positive impact on the health and quality of life of the people in the project areas through improvements in economic and hygiene and sanitation conditions. Positive impacts from rural water supply and sanitation arise from:

(a) time and energy savings for women and children;

(b) increased opportunity for women to utilize time saved towards economic and productive activities;

(c) effective use of water for bathing, washing and cleaning;

(d) better family planning practices due to reduced morbidity and infant mortality;

(e) improvements in hygiene and sanitation practices;

(f) reduced bacterial contamination because of controlled disposal of human wastes;

(g) better environmental management including catchment protection; and

(h) increased community capacity through participatory education leading to self-reliance and community independence.

8.4 Time and energy saved from fetching water would be utilized for better child care, family welfare, agriculture and other income generating activities. Time savings in the hills is considerably more than in the terai. Estimated average time savings from water supply is about 4 hours per household in the hills and about one hour in the terai. Additional benefits would be increased water consumption for cleaning, bathing and washing. The estimated total benefit from time savings and increased use of water is about NRs. 11 per household/day in the hills and about NRs. 2 per household/day in the terai. Estimated time saving benefit of the project is about NRs. 187 million per year. Time savings benefit in the hills would be about NRs. 148 million per year and about NRs. 38 million per year in the terai.

8.5 Energy savings from fetching water is estimated at about 600 K cal per household per day in the hills. Women in rural areas suffer more from malnutrition, anaemia and loss of energy due to their heavy work load of which water collection is a major task. Under such circumstances, energy savings of the above magnitude would significantly contribute to the health of women and children. Effective hygiene and sanitation education is likely to lead to better hygienic practices leading to improved health of the family. Reduced morbidity and infant mortality is likely to reduce fertility behavior with implications for better family planning. High infant mortality is a major factor for high fertility in Nepal.

8.6 Increasing community awareness of the importance of a clean environment and controlled disposal of human wastes through hygiene and sanitation education would reduce bacterial contamination of the environment. Catchment protection through community tree planting would lead to better environmental management. It would also provide fuelwood and fodder for the community.

8.7 Community education would contribute to improved literacy. Increased opportunities to practice problem solving skills would permit women to acquire confidence and greater ability to organize for cooperative action. Trainings such as VMW, mason, primary health care and other support services to women would provide employment and income earning opportunities for the beneficiaries. Skills learnt would lead to increased opportunities for future employment in other sectors as well, such as agriculture, forestry and cottage industry.

B. Negative Environmental Impacts and Suggested Mitigation Measures

8.8 Top soil erosion is a common phenomena in the hills of Nepal. It is accelerated by haphazard harvesting of fuelwood and timber, and by encroachment of steep slopes for cultivation and grazing. This has resulted in a continuous reduction of ground water resources as reflected by lower yields in spring fed stream and water wells during the dry seasons. To ensure source reliability over the life of the scheme, it is important to protect the catchment area by proper land-use. Community tree planting is an effective measure for catchment protection especially in the hills where depletion in source yield is high due to rapid deforestation.

8.9 Pollution of water source due to industries and sewerage systems upstream are less likely in rural areas of Nepal. Lack of proper sanitation practices, haphazard defecation along the banks of streams, litter especially from agriculture, livestock and human activities such as bathing, washing will pollute drinking water sources. There is also a possibility of chemical pollution entering the stream system and ground water (springs) from the use of chemical fertilizers and pesticides in agriculture.

8.10 Precautionary measures would be taken with respect to the area surrounding the water source. Clearance of woody vegetation at the intake and maintenance of proper drainage to protect it from intrusion of surface runoffs are required to minimize the possibility of contamination at the intake. When spring sources are developed in or near spring beds, surface drainage would be diverted around the spring protection chamber so that contamination would not take place.

8.11 Potential areas of negative environmental impacts due to rural water supply and sanitation projects are:

(a) erosion and water logging problems due to overflow or washout from water supply system components (specifically from reservoirs);

(b) pollution problem due to increased water use and inadequate waste water disposal;

(c) ground water pollution from inappropriate sanitation units (latrines) or from improper well construction techniques (allowing surface drainage into the well);

(d) adverse effects on health by bringing contaminated water closer to the household and hazards of using polluted source;

(e) increased water use for domestic purposes may deny other users in the future i.e. agricultural and other alternative uses;

(f) rapid expansion of settlement areas due to availability of improved water supplies may lead to over congestion and environmental pollution; and

(g) erosion due to construction activities such as quarrying and use of access roads, where undertaken.

8.12 Guidelines for environmental impact assessment of RWSS Project is presented in Table 8.1. Mitigation measures for any adverse impacts during planning, design and implementation phases of the scheme is suggested. Likely negative environmental impacts from rural water supply schemes are also identified in the District Development Plan (Arghakhanchi). Short-term impacts related to construction activities and long-term impacts related to operation of the water supply system is identified separately.

8.13 Site clearance and earth moving for citing system components during construction eg. intake, treatment units, reservoirs, and pipe laying could leave the site prone to erosion. The consequences of such activities are likely to be severe in steep hill slopes. Construction during the monsoon would be avoided since the rate of erosion is high at this time. Proper compaction would be done after excess soil is dumped and pipes are buried.

8.14 Deforestation to some extent is likely in the process of citing system components and providing timber for construction. However, such requirements are low. Cutting trees from steep slopes would be avoided to prevent erosion. Encroachment of endangered species would be avoided as well. Alternative citing for system components would need to be considered to minimize forest damage. Where cutting of trees is inevitable (either because of construction activities or provision of wood), there must be a forest replacement plan included in the sub-project proposal. Reforestation would be a community contribution.

8.15 Quarrying for construction materials especially stones in the hilly slopes may leave the site prone to erosion and landslides. It is important to avoid unstable slopes for quarrying. Excess water flow and clearance of vegetation along the track could occur. In such cases proper drainage system must be maintained.

8.16 Properly planned construction activities and appropriate site selection for system components during survey and design would reduce adverse effects.

8.17 As a consequence of source tapping changes in natural vegetation and reduced amount of water for wildlife and cattle could occur. But the effect of tapping a small flow for rural water supply would be negligible. Use of spring sources with low flow rates may divert the entire water supply. These would be studied carefully and proper planning and site selection to minimize such effects would be adopted. The key issue is not to disturb the existing agro-ecological system. Source disputes where they exist, would be resolved by community dialogue and community consensus. In the case of ground water extraction, reduced ground water level could dry existing shallow wells. Ground water table and safe yield would be investigated.

8.18 Erosion and water logging due to improper drainage of overflow and washout from leakage in water supply system components are likely. Drainage system around the structure would be designed and maintained.

8.19 Overflow and inadequate waste water disposal from tapstands or handpumps could create localized problem of mud puddles immediately surrounding the structure. Disease vectors breeding in stagnant water would pose health hazards to the surrounding area. This would create hygiene, health and aesthetic nuisance. Well water could be polluted in cases where wells are surrounded by sullage. A proper drainage system to drain waste water from tapstand or handpump to a safe place near a field or soakage pit would be incorporated in the design. Waste water would be used for kitchen gardening. Integration of hygiene and sanitation education to women and community awareness for its upkeep would reduce any likely negative impacts.

8.20 The use of low-cost sanitation units (latrines) could pollute ground water. Citing of latrines would consider such factors as soil type, depth of water table, drainage patterns in the area (i.e. no nearby water source would be down hill from the latrine) and proximity to water supply facilities. The platform of a latrine would be raised if the water table is high. Another option would be to provide a horizontally elongated pit with impervious floor with walls that allow movement of liquid.

8.21 Source pollution due to improper design and site selection would be avoided. In all cases source would be protected. During epidemics use of a common contaminated source would be disastrous.

8.22 Where water quality is not routinely tested and without proper provision for disinfection (in-home treatment of household storage tanks, or source treatment) it is possible that in some cases contaminated water would be brought closer to the households with predictable negative impacts. If water quality is not tested for bacteriological contamination provision for in-home treatment of water would be required. Integration of hygiene and sanitation education for proper handling of water to avoid post collection contamination at the household level would be imperative.

8.23 Improved water supplies by providing water closer to the household would increase water consumption and could deny other users eg. agricultural or other alternative uses. Community education on effective use of water would lead to increased understanding of demand and supply and reduce wastage.

8.24 Rapid expansion of settlement areas as a result of improved water supplies could result in overcrowding. This can be avoided by proper planning and cooperative community action.

Table 8.1: Guidelines for Environmental Impact Analysis of Rural Water Supply & Sanitation Schemes and Suggested Mitigation Measures

ACTIVITIES	IMPACTS - Negative + Positive	POTENTIAL POSITIVE IMPACTS	POTENTIAL NEGATIVE IMPACTS	MITIGATING MEASURES
CONSTRUCTION/IMPLEMENTATION PHASE				
1. Site clearance and earth moving for citing system components eg., intake, treatment unit, reservoirs and pipe laying.	- +	1) Employment generation for local people	a) Leave site prone to erosion. Consequence is severe in steep hilly slopes.	a) i As the rate of erosion during rainy season will be high avoid construction during monsoon period. ii Dump excess soil in nearby depressed areas and do not leave the soil loose. iii Compact the soil after pipe laying & refilling.
			b) Deforestation from clearing for structures, pipe laying and providing timber for construction.	b) Requirement is low, but cutting trees in steep slopes and encroachment on endangered species must be avoided.

ACTIVITIES	IMPACTS - Negative + Positive	POTENTIAL POSITIVE IMPACTS	POTENTIAL NEGATIVE IMPACTS	MITIGATING MEASURES
2. Quarrying for construction materials.	- +	i Employment generation through use of local manpower	Site prone to erosion and landslides, especially in the hilly slopes.	Avoid quarrying stones required for construction from unstable slopes.
3. Use of access road for transportation of materials.	- +	i Employment generation through the use of local manpower ii Movement of and services	Erosion due to clearance of vegetation and water flow along the track.	Proper drainage system along the road should be designed and maintained

ACTIVITIES	IMPACTS - Negative + Positive	POTENTIAL POSITIVE IMPACTS	POTENTIAL NEGATIVE IMPACTS	MITIGATING MEASURES
OPERATIONAL PHASE				
1. Source tapping from:				
A. Spring/stream water source causing reduced water seepage surrounding intake area and reduced flow downstream.	+ -	A. Potable water available	A. a) Change in the natural vegetation and reduced amount of water for wildlife and cattle.	A. a) Proper planning and site selection. The effect is negligible when tapping a small flow for rural water supply systems.
			b) When using spring sources, because of low flow rates, they may be diverted almost completely to the potable water system.	b) Plan not to disturb the existing agro-ecological system.
			c) Diversion of water from irrigation	c) Source disputes need to be resolved by community dialogue to promote community participation.
B. Ground water extraction causing reduced ground water level	+ -	B. Potable water available	B. Drying of existing shallow wells.	B. Proper planning and investigations of ground water table and safe yield. The small amount extracted by hand pumps may have insignificant effects.

ACTIVITIES	IMPACTS - Negative + Positive	POTENTIAL POSITIVE IMPACTS	POTENTIAL NEGATIVE IMPACTS	MITIGATING MEASURES
2. Overflow, washouts from water supply system components, and leakages.	-		Erosion and waterlogging due to improper drainage. (Amount of overflow water is, however, considerably less than monsoon drainage and erosion of natural channels due to extra flow from water supply is minimum)	The natural drainage system along with overflow water drains around the structure should be incorporated in design and maintained
3. Overflow and waste water disposal from tapstands or handpumps	- +	i. Income generation through kitchen gardening if drainage water is used in kitchen gardening	i Localized problem of mud and puddle immediately surrounding tapstands or handpumps ii Flooding and mosquito breeding posing health hazards in the surrounding areas. iii Hygienic and aesthetic nuisance. iv Well water pollution	i A proper drainage system to drain waste water from tapstand/ hand pump to a safe place near a field or soakage pit should be incorporated in the design. ii Responsible use of system and its maintenance should be encouraged through people's participation. iii Hygiene and sanitation education to women.
4. Use of Low-cost sanitation units (latrines).	+ -	i Reduced bacteriological contamination of the environment ii. Controlled disposal of human wastes, Training small children on latrine use	Ground water pollution.	i Proper citing of wells and latrines considering the soil type and proximity to water supply facilities. ii Need to raise latrine platform if water table is high.

ACTIVITIES	IMPACTS - Negative + Positive	POTENTIAL POSITIVE IMPACTS	POTENTIAL NEGATIVE IMPACTS	MITIGATING MEASURES
5. Use of common source	-		i. Source pollution due to improper design	i. Follow standard designs, protect the source, avoid landslide areas. Catchment protection through community planting
			ii. Without proper provision of disinfection, it is possible that in some cases (eg. stream sources) contaminated water could be brought closer to household. During epidemics the use of a common contaminated source may be hazardous compared with the use of several scattered sources.	ii Avoid selecting the source susceptible to pollution, Take sufficient source protection measures, and ensure that the source water is free of pathogens and bacteriological contaminations before selection or educate the users to use disinfect and at household storage
6. Availability of Improved Rural Water Supplies	+ -	i Time and Energy saving for women and young girls ii. Opportunity for economic activities from time saving	i Increased use of water and additional water resources in domestic use may deny other users i.e. future agricultural or alternative use.	i. Community education on use of water and involvement of community on every step of project cycle. Community understanding of source measurement, use of and supply and demand of the water
		iii Improved hygiene and health from frequent bathing, washing and other sanitary activities. iv Reduced morbidity and mortality from water related diseases	ii Rapid expansion of the settlement area may promote congestion, environmental pollution.	ii. Proper planning for coverage of entire community

ACTIVITIES	IMPACTS - Negative + Positive	POTENTIAL POSITIVE IMPACTS	POTENTIAL NEGATIVE IMPACTS	MITIGATING MEASURES
7. Community tree planting	+	i. Better catchment protection and environmental management ii. Availability of fuelwood and fodder for community use		
8. Hygiene and sanitation education	+	i Improvement in water and sanitation behavior ii Improved hyg[illegible] use of water iii Reduced bacteriological contamination of the environment promoting controlled human waste disposal iv Better environmental management v Reduced child morbidity and mortality leading to better family planning		
9. Community managed water supply project	+	i. Greater ability of community to apply problem-solving and organizational skills to implement sustainable water supply projects. ii. Future employment opportunities and income generating activities from skills learned		

ACTIVITIES	IMPACTS - Negative + Positive	POTENTIAL POSITIVE IMPACTS	POTENTIAL NEGATIVE IMPACTS	MITIGATING MEASURES
10. Non-formal education	+	1. Better literacy and group decision making ability of the community		

IX. ELIGIBILITY CRITERIA FOR SUPPORT ORGANIZATIONS AND SCHEMES

A. Summary

1. Support Organization Eligibility Criteria

9.1 The Fund will select support organizations (SOs) according to the following criteria:

(a) legal registration;

(b) constitutional provision to engage in RWSS and/or community development activities;

(c) proven track record of at least 2 years experience in RWSS and/or community development activities;

(d) accounts audited and certified; and

(e) staffing capacity to carry out the proposed services.

2. Scheme Eligibility Criteria

9.2 Each project will consist of two contracts, one for the development phase financing, and the other for implementation and post-implementation phase financing. Criteria for selecting schemes for financing includes the following:

(i) Development Phase

(a) Felt need: potential time savings per day/household is at least 2.0 hours for gravity flow; **or** widespread use of polluted source(s); **or** water consumption is less than 15 lcd;

(b) Technical feasibility: proposed source(s) yield is sufficient to meet 45 lcd or meets demand for at least 25 lcd; and

(c) Sustainability: more than 50% of the households indicate willingness to participate and contribute.

(ii) Implementation Phase

(a) Need: reconfirm need for improved services;

(b) Technical feasibility: undisputed source, water quality meets WHO standards, proposed source(s) yield is sufficient to meet 45 lcd or meets demand for at least 25 lcd; and compliance of engineering design with established Fund standards;

(c) Sustainability: a representative water user committee (WUC); assurance that there is complete coverage within communities; community commitment to provide all labor, material, porterage and minimum 1% (for gravity and spring protection) and 15% (for shallow tubewell) of hardware, design and supervision in cash; minimum 3% (for gravity, dugwell and deep well) and 4% (for shallow tubewell and spring protection) of capital cost upfront in cash in an O&M fund which should be maintained in subsequent years; 100% of incremental costs for higher service levels;

(d) **Economic viability:** scheme cost per capita does not exceed NRs. 1312 for gravity, NRs. 546 for spring protection, NRs. 244 for shallow tubewell, and NRs. 1020 for dugwell; or economic benefits exceed scheme cost in excess of 1.5:1

(e) **Environmental soundness:** appropriate mitigation measures for any adverse environmental impacts;

B. Project Review Process

9.3 The main objective of eligibility criteria is long term sustainability of schemes. Each project would have a cycle of 12 to 18 months and would consist of the following four phases: pre-development, development, implementation and post-implementation. To ensure economies of scale one sub-project would consist of 3-6 schemes (see chapter IV for details). The duration of each phase would depend upon community capacity and past experience in cooperative actions.

9.4 Two contractual agreements, one for the development phase and the other for the implementation and post-implementation phases would be made to qualifying SOs to implement projects. The development phase contract would be signed at the end of the pre-development phase, and the implementation and post-implementation phase contract will be signed at the end of the development phase. SOs and schemes would be reviewed by the Fund and approved by the Board (Figure 9.1).

1. Pre-development Phase

9.5 The pre-development phase has two components:

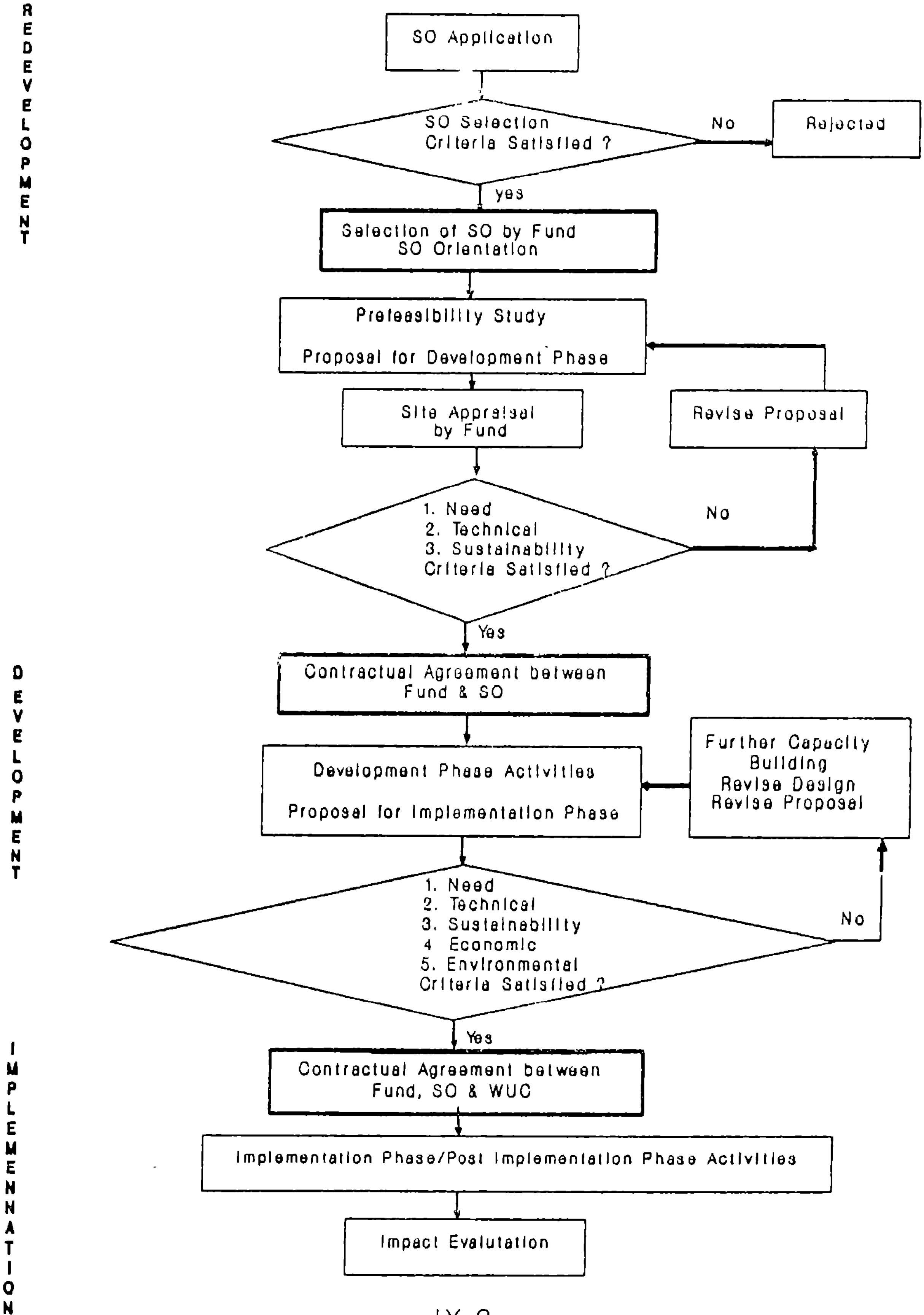
1. selection of support organizations; and

2. selection of schemes for development phase financing.

9.6 Selection of Support Organizations: The selection of SOs entails the following steps:

(a) Review of SO Applications. Support organizations would be required to fill out a SO Assessment Form (Annex 7) to prequalify to work for the Fund. This would assess the SOs legal status, finances, staffing, implementation capacity, the amount of work underway or committed, and proposed area of work. The Fund would meet with the staff of potential SOs to assess their institutional capacity and strengthening needs.

Figure 9.1: RWSS Scheme Review Process



(b) Site Visits to Previous SO Activities. Fund staff would confirm SO track record in community-based RWSS and/or community development work by visiting communities where the SO had previously worked.

9.7 SO applications would be appraised by the Fund's Technical Appraisal Committee (TAC). Qualifying SOs would be invited to participate in a 8-day SO orientation and introduction to participatory development workshop (see chapter II para 2.31 and Annex 11).

9.8 Scheme selection for Development Phase Financing. The selection of schemes for development phase financing will include two activities, one at the community level, and the other at the Fund level. These include:

1. Preparation of Prefeasibility Studies. At the community level the pre-development phase would entail undertaking a prefeasibility study (Annex 27) which would be the basis for the SO to prepare proposals for development phase financing. The prefeasibility studies would be undertaken shortly after qualifying SOs complete a 8-day orientation workshop (see chapter II para 2.31 and Annex 11). For each community the SO would prepare a community profile which would include information on socio-economic characteristics, community needs, source adequacy and reliability (Annex 18), community capacity, and community willingness to contribute and participate (see chapter IV for details).

   Output. Key outputs of the prefeasibility study would be a request for improved services and community willingness to participate and contribute from more than 50% of the households; and a proposal for development phase financing (Annex 12).

2. Scheme Appraisal for Development Phase. Appraisal would include site visits by Fund staff to a sample of proposed schemes of each subproject proposal to confirm felt need, request for improved services, source measurements, and community willingness to participate and contribute (Annex 30). Site appraisals would be undertaken in the driest season (April/May) to confirm reliability of potential sources. The appropriateness of software interventions would be assessed based on narrative descriptions of community capacity to organize, its experience in cooperative actions and literacy levels (see chapter IV Table 4.1).

9.9 One Fund staff member would be held responsible to present a report of the appraisal to the Fund's TAC. She/he would be the contact person in the Fund for that particular SO. Recommendations by the TAC would be forwarded to the Fund Board for approval.

9.10 Outputs. Key outputs during this phase include selection of support organizations and contractual agreements for development phase financing.

2. Development Phase

9.11 In the development phase communities, in particular women would develop the willingness and capacity to manage their own water supply and sanitation system. Key activities include:

1. Community organization (with SO assistance) leading to the formation of a water user committee (WUC);

2. Preparation of a community action plan (CAP) for community-based RWSS services with SO assistance; and

3. Selection of schemes by the Fund for implementation and post-implementation phase financing.

9.12 Community Organization. At the community level SOs would facilitate local people to mobilize and organize leading to a representative water user committee (WUC), identification of VMWs, the role of women, and training of WUC members to take on management of the improved system. During this phase the process for registering the WUC would have been initiated.

9.13 Preparation of a CAP. The CAP would include the following:

1. Community resource maps showing location of proposed schemes and time saved for each group in the community.

2 Narrative descriptions of major design and planning decisions such as choice of source, service level, number and location of tapstands/wells, options considered and user awareness of expected differences in reliability, convenience and health benefits, cost implications of each option considered and arrangements for making contributions to capital and O&M. The description would also contain information on how the WUC was formed and its composition by gender.

3. Justification for the nature and scope of software intervention for implementation phase and post-implementation phases.

9.14 Scheme Selection. Proposals for implementation phase would be appraised by the Fund's TAC. It would be appraised for compliance of need, technical, sustainability and economic criteria and environmental soundness. Non-compliance of criteria would not necessarily lead to outright rejection, but may take the form of a recommendation to re-design at which point it would be re-assessed to ensure it complies with established criteria. Only potentially contaminated sources such as sources where animals also bathe and drink, sources downstream of habitation would be tested for bacteriological quality to provide a basis for decision making (see Annex 18 for details). This would be reviewed as the Fund gains experience.

9.15 The Fund would require SOs to provide a description of the process, all information specified in Annexes 13 and 19, and timetable of implementation. SO institutional capacity would be reconfirmed to see that it has the required staff to carry out the implementation and post-implementation phase activities. The recommendations of the TAC would be forwarded by the CED to the Fund Board for approval. A copy of the proposed project proposal would be sent to the District Development Committee (DDC).

This would allow the DDC to update and avoid duplication of RWSS activities in the district.

9.16 Outputs. Key outputs at the end of this phase would be a representative WUC with at least 1/3 women, a community action plan (CAP) as a proposal for implementation and post-implementation phases which would include a statement of community contributions for capital (cash, labor, material and porterage), and a contractual agreement between the WUC, Fund and SO for implementation and post-implementation phases.

3. Implementation Phase

9.17 This phase would include mobilization of local resources and supervision of construction of water supply and sanitation schemes, a more intense hygiene and sanitation education (HSE), training of WUC members, and VMW and mason trainings.

9.18 Arrangements would be made by the Fund to test groundwater sources tapping shallow aquifers less than 10 meters deep after development and disinfection. Sources which are not free of fecal coliforms would be capped to ensure that a pump cannot be installed. Similarly enclosed and protected springs would be tested before final selection to ensure that they are free of fecal coliforms, i.e. 0/100ml.

9.19 Outputs. Key outputs include improved water supplies managed by a representative and trained WUC, increased use and construction of latrines, and trained women's groups for HSE.

4. Post-implementation Phase

9.20 This phase would include follow-up and operation and maintenance activities, continued HSE training and other related activities such as monthly meetings with women's groups, skill enhancement training to women, follow-up health KAP and/or healthy home surveys, and latrine construction. The SO would help the WUC and women's groups to establish linkages with programs that have a credit component such as the Small Farmer's Development Program (SFDP) and Production Credit for Rural Women (PCRW). Before completion of post-implementation phase the WUC would be registered. Upon completion of this phase the SO would prepare a completion report.

9.21 The Fund staff would visit a sample of schemes to establish conformity with initially approved scope of work. The Fund would review and provide to the Fund Board a completion report and a technical audit of a sample of schemes of each SO.

9.22 The Fund would monitor and evaluate the impacts of interventions on a sample of communities to identify cost effective measures to improve rural health and sanitation.

9.23 Outputs. Key outputs include sustainable RWSS, hygienic and optimal use of water, and increased access of women's groups to the formal credit system.

C. Support Organization Eligibility Criteria

9.24 Support Organization Eligibility Criteria. All potential support organizations would be required to meet the following criteria to prequalify for financing by the Fund. These include:

(a) Legal status

* Local governments are automatically legally recognized. Nongovernmental organizations and CBOs would be currently registered with any one of the following: the Society Registration Act, Social Welfare Act, Cooperative Society Act, Company Act, Water Resources Act, or the Private Firm Registration Act.

(b) Constitution

* SO constitution and by-laws would permit it to engage in RWSS and/or community development activities.

(d) Track record

* proven track record of at least 2 years in RWSS and/or community development activities.

(e) Finance

* Adequacy of finances would be assessed by a review of audited accounts.

(f) Staff

* The organization would have sufficient staff or demonstrated ability to recruit appropriate staff. This includes demonstration of software and hardware backstopping of field level staff to supervise design and construction, M&E, sanitation technology, hygiene and sanitation education and integration of gender issues.

D. Scheme Eligibility Criteria

9.25 The Fund will select schemes for financing development phase, and implementation and post-implementation phases.

1. Development Phase Eligibility Criteria

9.26 Scheme eligibility for development phase would include need for improved services, sustainability and technical feasibility. Indicators to determine need, sustainability and technical feasibility include the following:

(a) Need. Need for water would be demonstrated in terms of time cost in water collection, or widespread use of contaminated water, or water consumption is less than 15 lcd. Indicators include any one of the following:

* potential time savings per household/day is at least 2.0 hours for gravity flow. Households in the hill make about 6-8 trips per day in about 30 minutes (round trip). Providing service within 10 minutes would save at least 2 hours. The benefit from time saved would ensure economic rate of return required to justify investments (see chapter VII for economic justifications); or widespread use of contaminated sources such as use of sources where animals also bathe and drink, and sources downstream of habitation; or water consumption is less than 15 lcd.

(b) Sustainability. Indicators include:

* A request for improved services and community willingness to contribute and participate from more than 50% of the households.

(c) Technical criteria. Indicators include:

* Proposed source(s) capacity is sufficient for 45 lcd taking into account water demand for household maintenance, domestic animals, personal hygiene, wastage and leakages.

* In cases where the proposed source(s) cannot meet 45 lcd the lowest per capita consumption acceptable is 25 lcd (see Annex 15 for details).

* surface water, including spring fed streams, would not be used as a source (see Annex 18 for details) unless the surface water and its catchment are unlikely to be contaminated and an initial fecal coliform test gives a level less than 10/100ml, or effective in-home treatment can be implemented by community members. A study on in-home treatment would be carried out by the Fund before this option is generally applied.

* other water quality parameters such as levels of iron, fluoride etc. would not be routinely tested unless problems are suspected. But if calcium deposit is a problem such source would not be tapped.

* water color, taste and odor are acceptable to the users.

2. Implementation Phase Eligibility Criteria

9.27 Scheme criteria is concerned with need, sustainability, technical and economic viability and environmental soundness of schemes. Implementation phase proposals would be required to meet all established criteria. Criteria/indicators include the following:

(a) Need. In the development phase need would be reconfirmed with more accurate measurements of time saved, levels of water consumption and use of polluted sources from a representative sample of each group in the community. Time savings would be determined from resource map. Indicators include any one of the following:

* Potential time savings per day/household is at least 2.0 hours for gravity flow (see chapter VII for economic justification), **or** fecal coliform of existing sources is more than 10/100ml, **or** water consumption is less than 15 lcd.

(b) Sustainability Criteria. The potential for community management would be determined by the level of community organization and willingness to contribute and participate. It has been observed that in areas where the level of need/demand is high there is a greater interest and willingness to contribute (see chapter VII for details). Information on rural household income (MHPBS, 1986) indicates more than 90% can afford to pay Rs. 12-30 per month for water supplies. Affordability is not an issue and a small cash contribution towards scheme construction would enhance community ownership. For scheme sustainability complete coverage of a community is important. Data from the District Development Plan (DDP) of Lumbini (FINNIDA) indicates there is at least one point source for each settlement in the hill and 10-12 point sources in the terai for each settlement. In light of this it is unlikely that two communities would need to share the same source. It is more likely that settlements within a community would have to share a point source, hence the practicality of using complete coverage within communities as a criterion. Indicators include the following:

* A representative WUC to sign implementation agreement with the Fund and the SO and assurances there is complete coverage in the community. The WUC would be aware of proposed source(s) capacity and that it is sufficient for 45 lcd or meets demand for at least 25 lcd.

* Signature from all households that the entire community is covered.

* For schemes which provide the standard service level, communities would contribute the following

  - all unskilled labor, local materials and porterage. This would result in communities contributing 25%-50% of the cost of gravity schemes and 15%-20% of the costs of well and tubewell schemes (see chapter VII for details).

  - cash contribution of minimum 1% (for gravity and spring protection) and 15% (for shallow tubewell) of hardware, design and supervision to foster a sense of ownership and to encourage communities to seek low cost design solutions.

  - communities would take full responsibility for operation and maintenance. They would deposit minimum 3% (for gravity, dugwell and deep well) and 4% (for shallow tubewell and spring protection) of capital cost upfront in cash in an O&M fund which should be maintained in subsequent years. This percentage is based on current estimates of annual O&M costs (see chapter VII for a more detailed discussion), and would be subject to review as the Fund gains experience;

* Communities would contribute 100% of the incremental scheme costs for improvements over the standard service level.

(c) Technical feasibility. Technical feasibility is concerned with source adequacy, questions of physical scale, design, layout, location of facilities, service levels, technology and their appropriateness to local conditions. Indicators include the following:

* Signature of all WUC members that the proposed source is acceptable and that there is no source conflict within and between neighboring community.

* If source is on private land signature of owner agreeing to use of source.

* Signature of all households that design of tapstand and layout is acceptable. The resource map would show how the scheme would improve services to each group/settlement in the community.

* Signature of technical officer who surveyed and prepared design to ensure that design is technically feasible and complies with established design standards (Annex 15).

  - For gravity flow systems the location of tapstand would be within 150 meters for any household. In sparsely populated areas with no competitive traditional sources 250 meters distance is acceptable for location of tapstand

  - In the terai one tubewell would serve 10-20 households within a radial distance of 150m

  - conformity of design standards in relation to provision of drainage and sullage around schemes and system components.

(d) Economic Criteria. Economic appraisal is an attempt to establish the value of a project to participating communities. Schemes would provide adequate benefits to justify investments. The cost of RWSS per capita would be below or does not exceed agreed ceiling, or that benefits exceed where achieving certain standards implies higher costs. Indicators/criteria includes any **one** of the following:

* scheme cost per capita does not exceed NRs. 1312 for gravity, NRs. 546 for spring protection, NRs. 244 for shallow h.t. well, and NRs. 1020 for dugwell;

* Acceptable economic rate of return (ERR=15%). This will make allowance for risk and uncertainty which may arise from differences in assessment of actual costs and benefits (see chapter VII). If schemes involve higher per capita costs it would need to demonstrate that economic benefits exceed scheme cost in excess of 1.5:1

(e) <u>Environmental Soundness</u>. Mitigation measures to address possible negative impacts of individual schemes would be incorporated in designs to ensure that they meet agreed criteria. If any threats exist appropriate mitigation measures would be carried out by the community.

* Mitigation measures for any adverse environmental impact that may threaten the source due to construction and operation of activities such as landslides, deforestation in catchment area and pollution due to human activities in the catchment area complies with established mitigation measures (see chapter VIII for proposed mitigation measures), provision for source protection.

E. Criteria for Prioritizing Competing Subprojects

9.28 Prioritization of schemes would be necessary only if the number of proposals that meet established criteria exceeds the capacity of Fund staff to handle them. This seems to be unlikely in the first two years of RWSSP implementation in view of the number of potential SOs (see chapter VI) capable of implementing community-based RWSS services such as that envisaged by the Fund. If it becomes necessary to prioritize competing proposals criteria that would be appropriate for prioritizing competing proposals include the following:

* sub-projects serving a cluster of communities within contiguous areas (see chapter V);

* schemes which obtain community commitment for capital and O&M contributions over and above the minimum (para 9.27);

* schemes with low per capita investment and O&M costs; and

* schemes that serve low service level areas where there is demonstrated felt need for RWSS.

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10. King Mahendra Trust for Nature Conservation Act 1982 A.D.
11. Social Services National Coordination Council Act 1977 A.D. (repealed)
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15. Contract Act 1966 A.D.
16. Public (offenses and punishment) Act
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19. District Panchayat Act 1962 A.D. (repealed)
20. Canal, Electricity and Water Resources Act 1967 A.D.
21. Drinking Water Regulation 1993 A.D. (Draft)
22. The Constitution of the Kingdom of Nepal 1991 A.D.

APPENDIX A

PROPOSED RURAL WATER SUPPLY AND SANITATION PROJECT

TERMS OF REFERENCE

UPDATING OF FINAL PREPARATION REPORT (PHASE III)

I. BACKGROUND

1. Continuing low coverage in rural water supply and sanitation, coupled with the fact that many previously completed schemes suffer from serious problems of disrepair has raised concerns over the effectiveness and sustainability of existing approaches in the sector.

2. Preliminary preparation studies for a proposed IDA-financed rural water supply and sanitation project were completed in October 1990 by an international and local team of consultants led by Binnie & Partners. Following significant change in HMG Directives for the implementation of rural water supply and sanitation projects, further preparation work was carried out by a team of local and international consultants managed by East Consult resulting in a Final Interim Report Phase I.

3. Phase II of preparation was carried out by a team of local and international consultants led by Development Alternatives Nepal. Phase II took into account recent events that took place in Nepal, particularly HMG's decentralization initiatives, new legislation for development at the village and District levels, recommendations for administrative reform in the civil service, a new openness toward the involvement of NGOs in service delivery and a high level government decision to pursue the establishment of a central Rural Water Supply and sanitation Fund (hereinafter called the Fund) to finance community based initiatives in rural water supply and sanitation. The major tasks under Phase II were a continuation of the work undertaken under Phase I of preparation and included the further definition of:

(a) project organization;

(b) legislation, rules and operating mechanism for the creation of the Rural Water Supply and Sanitation Fund;

(c) project components;

(d) cost estimates and phasing;

(e) economic and financial analysis;

(f) legal issues; and

(g) environmental impact assessment.

4. Phase II was completed in July 1993 with the publication of a final project preparation report. Project pre-appraisal was carried out by IDA in June 1993.

5. Phase III which is financed by a Japanese Grant, started in March 1993. It primarily consists of field testing of rural water supply and sanitation

service delivery options. The field testing will, in particular, test the eligibility criteria which were defined within Phase II as well as proceed with project implementation, although on a reduced scale, through a pilot operation where Support Organizations (mostly NGOs) will actually be recruited to deliver services. The field testing project has just signed its first implementation contracts with several Support Organizations. Phase III also includes funding to update the final project preparation report in light of the findings of the field testing.

II. Scope of Phase III Consultancy.

6. The updated final preparation report will cover all aspects of the proposed project including, but not limited to, project description, cost estimates, financing plan, criteria, processing arrangements and analysis of benefits. A number of key actions have been identified below to update preparation in time for the appraisal mission currently scheduled for November/December 1993. It is essential that the consultants work closely with and incorporate the experiences of the Field Testing in addressing these issues. This will include participation in evaluation of Support Organizations proposals and field visits. The starting point of this exercise is the Final Project Preparation report published in July 1993. For this reason comments have been provided below on each chapter of that report and form the scope of work for this consultancy.

Chapter II. The Rural Water Supply and Sanitation Project

7. Terms of reference should be prepared for all studies,

8. Finalize the monitoring and evaluation (M&E) framework development in the final report. Specific actions include:

(a) Prepare the M&E action plan to cover the following areas: (i) the purpose and users of M&E;, (ii) types and levels of M&E required and their main components; (iii) monitoring indicators (to refine the indicators listed in Annex 21), and (iv) the M&E system that needs to be developed which will cover:

(1) The types of information to be assembled and the formats for assembling the information within and outside the Fund; (2) information and indicators required to be collected at the community level (community monitoring); (3) arrangements and frequency of reporting and the instruments and the reporting feedback to be used; (4) the staffing and responsibility for monitoring needed both at the Fund and community levels; (5) outline and topics of the impact evaluation; and (6) action plan to establish the M&E including local and foreign technical assistance required for methodology, data gathering and analysis as well as timing.

Chapter III. The Rural Water Supply and Sanitation Fund

9. A system of unit costs and prices to assist evaluation of Support Organization scheme cost proposals needs to be developed.

10. The draft subsidiary grant agreement needs to be prepared.

Chapter IV

11. Complete the Institutional Manpower Assessment. The updated final report should (a) cover more SAs, (b) complete the full analysis of data on manpower, and (c) present information in a summary table/matrix including:

> (i) number and size of SOs, SAs and SO/SAs; (ii) staff composition and characteristics (gender, education and skills;, salary and length of experience; (iii) estimates of actual time spent in work activities (for government staff routine activities); (iv) estimated time available to work for Fund activities; and (v) specific suggestions for involvement in RWSS activities (specially the government sector potential SAs).

Chapter V

12. Finalize the Hygiene and Sanitation Education (HSE) Framework to cover:

(a) clear HSE objectives and activities; (b) organization and delivery; (c) approach and strategy including communications strategy; and, (d) linkages with the sanitation strategy and demonstration latrines program. From the experience of other NGOs/private groups a more detailed implementation action plan should be prepared which would focus on activities to support;
(i) target groups and individuals and attitudes and behavior; (ii) approach to encourage behavior change and communication channels to be used; (iii) strategy for material development and program for orientation and workshops, and specific training for SOs, government health staff (as appropriate), and the community; (iv) HSE in the schools; and (v) costs of HSE. The action plan should identify clear activities, roles and responsibilities as it relates to the sub-project cycle activities.

13. Finalize details of the Sanitation Support Program which would include recommendations and arrangements for the private latrine program, terms and conditions.

14. In the context of environmental sanitation, the consultants will assess the demand for small scale community drainage, examine possible technical solutions and determine necessary inputs in terms of technical support, community organization, material inputs, etc The consultants will recommend whether this component should be included. If so, the consultants should make appropriate recommendations on costs and implementing the component.

15. Finalize methodology for the Community Development sub-component including a summary table/matrix of all orientation, workshops and training to be supported by the proposed project at the Fund (program) and community levels, responsibility, including types of training and methodologies, number of target audience or participants, inputs to be provided (training materials, cost of training etc).

16. Prepare details of the technical support services for women as described in Annex 1, para 8 including cost estimates.

17. Review Annex 9 on the Process of Registering Water User's Committee in the light of the Field testing experience that would include a step by step

process for registering WUC including specific guidelines on the composition, role and functions of WUC as it relates to the sub-project cycle activities

18. Prepare Draft Project Guidelines which will include the above annexes along with other formats, criteria developed for review during appraisal. The mission recommends that arrangements be made that the results of the field testing activities being carried out be taken into account in the preparation of the project guidelines in particular the criteria, processes, formats, contracting procedures and procurement arrangements for; (i) registering and selection of SOs; and, (ii) preparation of sub-project proposals for the development phase.

Chapter VI - Costs

19. The cost estimates will be updated in the light of new components, e.g. technical support services for women, and possible changes in the mix of scheme types (see para 28). Guidelines should be developed to assist SOs to produce accurate and complete costs which would facilitate cost comparisons by the SO and the Fund. The consultants should assist the Field Testing and the SOs to test the guidelines and the results, including examples of each type of scheme, should be presented in the report.

Chapters VII and IX - Eligibility Criteria and Economics

20. It is desirable that the criteria identified and proposal forms recommended in the Draft Final Report be thoroughly tested by the Field Testing, and appropriate modifications, be introduced in the light of experience. Special attention needs to be paid to securing accurate initial information on likely need, prime facie evidence of potentially viable schemes, and then indicators of benefits. Capacity of Support Organizations to estimate ERRs for a sample of projects should be tested. In addition, willingness to pay must be tested by ensuring that appropriate contributions are paid.

21. Criteria to Prioritize or to Accept Proposals. One issue on which experience will be gained and recommendations made in the report concerns the number of proposals, their quality, and the capacity of staff to handle them, and hence the extent to which it will be possible to approve all projects which meet criteria, or whether criteria will also be needed to prioritize acceptable schemes. This will have a significant impact on the nature of indicators to be used, and also processing procedures (since using criteria to compare projects with each other, rather than defined standards, implies periodic rather that continuous reviews of proposals).

22. Area Targeting: It needs to be determined whether there should be some targeting of specific communities or areas, or whether complete reliance could be placed on selecting from proposals coming from the field. The project would aim to pursue a "bottom up, demand-driven" approach, which implies the latter. On the other hand, there may be reasons to consider targeting certain areas or underprivileged communities which might stand to benefit highly from schemes but be overlooked under a pure demand-driven approach. The report should take into account, inter alia, the criteria being developed for the proposed poverty alleviation fund.

23. The only comprehensive data known to the mission which are available to enable relatively rapid analysis of this issue have been collected by the

FINNIDA/DWSS project for the six districts of Lumbini zone. These data should be analyzed in some detail in the updated final report. Issues to be investigated are differences in coverage among contiguous communities (are there pockets of disadvantaged communities?), the extent to which different communities must share common sources, what practical indicators can be developed to enable the Fund to judge whether there is a need for more attention to contiguous areas (e.g., content or maps locating schemes to be provided in the pre-development phase), estimates of cost savings which might occur from clustered versus dispersed sub-projects. Many indicators may differ in different areas (hills, Terai, inner Terai).

24. Sanitation Component: The consultants shall make recommendations on the size of sanitation loan funds in the light of appropriate sub-loan amounts to community members, and the number of times the fund should be expected to revolve before all families who want latrines have them.

25. Measures of Need and Benefits: It is important that the schemes under the Field Testing attempt to test the usefulness of initial indicators of need and potential benefits, not only the nature of the existing situation, but also the likelihood that it can be improved (i.e, time saving, more availability, cleaner supplies, etc.). The extent to which this information can be efficiently refined during development phase should also be tested, and the ease with which it is possible to quantify benefits. This may have important consequences for determining minimum information gathering to be required initially by the Fund. The consultants shall review the initial experience of the Field Testing and incorporate their findings in the recommendations.

26. For the updated final report there should be special efforts to secure better estimates of time savings in the case of Terai schemes.

27. Economic Criteria: The threshold criteria need to be reviewed in the light of better information on costs and benefits (from FINNIDA/DWSS, Field Testing), and the number of projects which would exceed per capita cost thresholds should be estimated.

Design Service Level Standards:

28. There is a need to examine the incremental costs of different design standards (more or fewer l/c/d, distance from tapstand to households, density of wells). This analysis can be based upon comparison of different schemes. It may involve engineering exercises. This should also be useful in ascertaining the possible incremental contributions for communities wanting higher than standard service levels.

29. Before appraisal, it would be desirable to have a better analysis of the quantitative relationships between design service levels and ERRs. In addition to examining cost implications of service levels (para 23 above) this involves examining benefits as well. Specifically, the fewer wells or taps per household, the lower the costs (but also the lower the benefit). More justification is required for the assumed 100 households per shallow tube well and 200 per deep tubewell. Exploitation of the Lumbini zone data should be invaluable in this regard. The benefits associated with the standard service level of 45/l/c/d for design population needs to be examined. The AIIPH (1992) study finding, which confirmed that of other studies, of consumption with schemes of around 25 l/c/d "without" schemes, suggests this standard is

excessive (if the water is not even used). In fact, availability will for many years be even more excessive (depending on growth rate and planning horizon).

30. The appropriate planning horizon needs to be considered, and be negatively related to growth rates. With growth rates of over 3% in the Terai, a planning horizon of 20 years implies providing facilities at roughly <u>twice</u> the standard (for present population). This seems excessive, where resources are scarce.

31. <u>Source ownership:</u> Satisfactory evidence for effective access to sources needs to be clarified including the issue of shared access to sources by competing users. There should be further examination of past practice on this issue, legal precedent, and likely and desirable legal changes (in the context of the new Water Resources Act and draft regulations) in this report.

32. <u>Cost Estimates for Schemes:</u> Need to be reviewed in the light of market conditions (and experience of the Field Testing and other projects). This should apply equally to software as well as hardware elements. Special attention should be paid to deep tubewells which appear to have excessive costs in the DFR.

33. <u>Proposed Mix of Scheme</u> Based on review of need for schemes and likely benefits, the consultants need to review the estimated mix of scheme types and incorporate resulting changes in cost and phasing. For example, if gravity schemes are a larger proportion of the whole, administration costs may need to be more targeted to smaller disadvantaged communities, there may be fewer economies of scale than assumed in the DFR.

34. <u>Studies:</u> The list of possible studies in the aide-memoire needs to be refined, increased or decreased, terms of reference drafted, and estimates made of professional inputs and costs.

III. Staffing, Timetable and Reporting

35. The consultant team should be experienced in the following areas (some team members may cover more than one area):

- rural anthropology/sociology;
- law;
- institutional reform;
- economics and financial analysis;
- sanitary engineering;
- community development;
- Nongovernmental organizations; and
- training.

36. One of the above team members must be designated as Team Leader to manage the work.

37. The consultant will submit the following reports:

(a) Draft Updated Final
Preparation report phase III..........13 weeks after
contract signature.

(b) Updated Final Preparation Report .... 4 weeks after receipt of comments.

38. Fifteen copies of these reports will be prepared. The reports will be written in the English language.

ANNEX 27

THE RURAL WATER SUPPLY AND SANITATION PROJECT
ANNEX 27: PREFEASIBILITY FORM

I **LOCATION** (Discussion with key informants i.e. community leader, school teacher, women etc)

1 Village name/s of community ______________ 2 Wards ______________________

3. Name of VDC ______________ 4 District ______________

5. Distance from district headquarter _______ Kosh or ______ Km or _____days walk

6 Name of nearest roadhead ________ 7. Distance to nearest roadhead _____ kosh or _____ Km or ______ days walk

8. Name of nearest town/market where construction materials (cement, pipe etc) are available ________

9 Distance to nearest town/market where construction materials (cement, pipe etc) are available ____ Kosh or ____ Km or ____ days walk

II **DEMOGRAPHIC INFORMATION** (Discussion with key informants i.e community leader, school teacher, women etc)

10. Total no of households in the community --------------

11 Total present population in the community -----------
Men . . Women . . Children

12 Community settlement pattern (circle one): scattered/evenly spread/clustered

13 Ethnic composition, settlements and no of HH

S No	Settlement/ Cluster name	Ward nos	Ethnic group	No of HH by ethnic group	No of HH by settlement
1					
2					
3					
4					

III **SOCIO-ECONOMIC INFORMATION** (Discussion with key informants i.e community leader, school teacher, women etc)

14 Major occupation in the community (based on primary source of income)

	No. of HH
Agriculture	
Business	
Service	
Wage labor	
Others (specify)	

15 Annual migration pattern of the community (Based on last 3 years experience)

	Seasonal	Permanent	Reasons
Out-migration (No of HHs)			
In-migration (No of HHs)			
Increased No of HH (Permanent)			

16 Nearest public facilities used by the community

Public facility	Located in the community ? (yes/no)	If located outside community approx distance (km)
Schools	Total no of students	
Health post		
VDC office		
Bank		
Others (specify)		

IV NEEDS ASSESSMENT

17 Describe all existing water sources in use (Visits to all sources in use and discussion with key informants including women at each source)

	Primary source mainly for domestic use more than 8 mths/yr (P)						Other seasonal sources (S) for domestic use			
SOURCE NO DESCRIPTION	I	II	III	IV	V	VI	VII	VIII	IX	X
Name of source										
Type of source (spring/dhungedhara/stream/kuwa/dugwell/tubewell/tap/ pipe										
Describe source area (forest/field/community)										
No of households using this source [H]										
Approx avg distance from central HH to source (m) [1]										

[1] Walk to the source from the middle house in the cluster using the source

	Primary source mainly for domestic use more than 3 mths/yr (P)						Other seasonal sources (S) for domestic use			
SOURCE NO DESCRIPTION	I	II	III	IV	V	VI	VII	VIII	IX	X
Approx walking time (round-trip) from central HH to source including waiting time (min)[2] [T_1]										
Avg waiting time (min)										
No of trips per day per household for domestic use[3] [X]										
No of trips per day per household for animal consumption[4]										
(Average no. of large animals (buffalo) per household .)										
No of liters per trip [Y]										
Total no of liter/hh/day [Z=X*Y]										
Water quality at source (clear/turbid/taste)										
Sanitary condition around source (bad/fair/good)										
Does the source dry (yes/no) If yes write no. of mths this source is used [M_1]										
Which source is used during these mths (identify source)										
How many months these source is used. Write no. of mths [M_2]										
Approx walking time (round-trip) from central HH to this source including waiting time (min)[5] [T_2]										

[2] Time required to walk to the primary source, waiting and return from the middle house of the cluster using the source

[3] Includes drinking, cooking and washing dishes

[4]. Select household with average number of animals

[5] Time required to walk to the seasonal source, waiting and return from the middle house of the cluster using the source.

18 Water supply coverage in the community (Deduce from 17 above)

Number of households with access to adequate source*	
Total number of households in community	
Percentage	

* adequate source is defined as potable water from protected springs wells, tubewells, gravity schemes within a distance of 150m from the household

19 Frequency of bathing and laundry (community average based on information from all clusters) Tick mark

	Daily	At least once a week	At least once a month
Bathing			
Laundry			

20 Average time taken per round trip for water for HH consumption. Weighted average from all sources [6] . . .

21 Average household water consumption weighted average from all sources [7] (lcd) . . . ..

22. Percentage of households using less than 15 lcd of water ....

---

6 . Use Table 17 to calculate average time required for the community.

1 Multiply time required to fetch water for domestic use (T_1) and no of months the source is used (M_1)

2. If the households using above source also use other source during dry season, multiply time required to fetch water for domestic use from other source (T_2) and no of months other source is used (M_2).

3 Add results of step (1) and (2) and multiply by no. of household using the source (HH).

4. Repeat steps (1) to (3) for all primary sources in use and add.

5 Divide the result of step (4) by total no of households in the community and 12

7 . Use Table 17 to calculate average household water consumption for the community

1 Multiplay households (H) and no of liters/hh (Z) for each source

2 Add results of all sources

3 Divide 2 by total no of households in the community

23. What are the major shortcomings of present water situation in the community? (Rank 1,2,3.)

a Distance to fetch water during the whole year ( )
b Distance to fetch water during the dry season only ( )
c Year round water supply exist but is of poor quality ( )
d Year round water supply exist but is of low yield ( )
e Overcrowded water points with high risk of water contamination ( )
f If Others (specify)
______________________________ ( )
______________________________ ( )
______________________________ ( )

24 General sanitary condition in the community (Tick mark).

	Poor	Fair	Good
a Drainage			
b Waste disposal			

25. No of households using latrine in the community _______

26 Major health problems in the community

Three most common illness among children under 5 years	Frequency of occurence per year	Which mths is it most prevalent
1		
2		
3		

27. List in order of priority 3 felt needs identified by the community
1 ______________________
2 ______________________
3. ______________________

28. If water supply is identified what effort has been made by the community towards this (Describe briefly)

----

29 Why did it not materialize ? (Please rank in order of priority)
a. Due to lack of technical knowhow [ ]
b Due to lack of financial resources [ ]
c Inadequate source [ ]
d. Source dispute [ ]
e. Others (specify) [ ]

V WATER ADEQUACY AND RELIABILITY

30 Proposed sources for Water Supply in the community (Visits to all sources and discussion with key informants and women

DESCRIPTION	PROPOSED SOURCE				ALTERNATIVE SOURCE	
	I	II	III	IV	I	II
Name of source/s						
Type of source (spring/stream/groundwater)						
Location (ward no)						
Describe source area (forest/ field/community)						
Who is using the source at present (village name & ward Nos)						
For what purpose is the present source being used (water supply/irrigation/ mill/power/other)						
If source is on private land permission to use (likely/ unlikely)						
Possibility of source dispute (likely/ unlikely)						
Approx. walking time one way from source to community (min)						
Approx. distance from source to community (Km)						
Is proposed source acceptable to the community (Yes/No)						
Water quality of source (clear/turbid/colored)						
Possibility of pollution of source (likely/unlikely)						
Measured yield of source (l/s)						
Date of measurement						
Yield in dry season according to community (l/s)						
Safe yield						
Source (perenial/dries some months) No. of mths. it dries						
Environmental threats and protection requirements (Yes/No)						

31. Beneficiary Population

Total present population in the community to be served (P)_________

Based on community growth pattern (15) and district/VDC growth rate

Adopted growth rate (r)______________ Design period in yrs (n)______________

Future population to be served (FP) [$P \times (1+r)^n$]__________ Design water demand @ 45 lcd (D) [FP × 45 (l/d)__________

Required source yield for 45 lcd [D/86400] (l/s)__________ Design water demand @ 25 lcd (D) [FP × 25] (l/d)__________

Required source yield for 25 lcd [D/86400] (l/s)__________

32 Source adequate to serve the community for 25 lcd or 45 lcd

VI **TENTATIVE SCHEME COST** (Use following breakdowns for different components that are likely to be required to calculate tentative scheme cost)

33. Source development requirements:

No. and type of sources ____________________

Structural requirement ____________________

Length of dams and or catchment walls ____________________

No. of Collection tank and/or sedimentation tank ____________________

Protection against erosion, floods etc ____________________

34 Conveyance

Approx length of system (km) ____________

No. of small streams, gully crossing __________

Length of rocky section ____________

No. of point with landslide and serious erosion problem ______________

No. of BPT's and Interrupton chamber ______________

No. of Distribution chamber ____________

No. of valve chamber ____________

35 Requirement of reservoir (Tentative Nos. and size)

Nos ____________ Size ____________

36 Tentative no. of standposts ____________

37 Availability of local materials

Materials	Distance (Km)
a. Sand	
b. Gravel	
c. Stone	

38 Local rate of labor in the community.

Labor	Rate
Skilled labor	. Rs/md
Unskilled labor	. Rs/md
Porter	Rs/kg (Rs/kg/km) from road head to scheme site

39 Approx. percapita cost adopted and tentative total cost of scheme

Percapita cost Rs. __________ Total cost Rs ______________

VII COMMUNITY CAPACITY

40 Development activities undertaken by the community in recent years

Activities	External/self support	Community contribution (Yes/No)	Women's participation (high/low)	[illegible]
School, community Building				
Irrigation				
NFE				
Community Forest				
Drinking Water				
Other (specify)				

41. Local organizations including women focussed organization in the community

Organization	Year of establishment	Activities	No. of member	No. of women members

42 Has NFE classes been held in the community?

☐ Yes ☐ No

If Yes

a. Who sponsored the classes? ________________
b. How many participants completed the NFE program? ________
c. Year when NFE class started ________________

43 Is there any on-going hygiene education in the community at the moment? (Yes/No) ________
If yes, who is sponsoring it? ____________________________

44 Are there other on-going development programs in the community such as SFDP, PCRW, etc.?(List Name) ___
____

45 Are local facilitators (men/women) available in the community for

	NFE	HSE	Community organization	Skilled labor for construction
Men				
Women				

VIII WILLINGNESS TO CONTRIBUTE

46 Is the community willing to contribute for (Ask the community after discussing tentative cost of the scheme for different options)

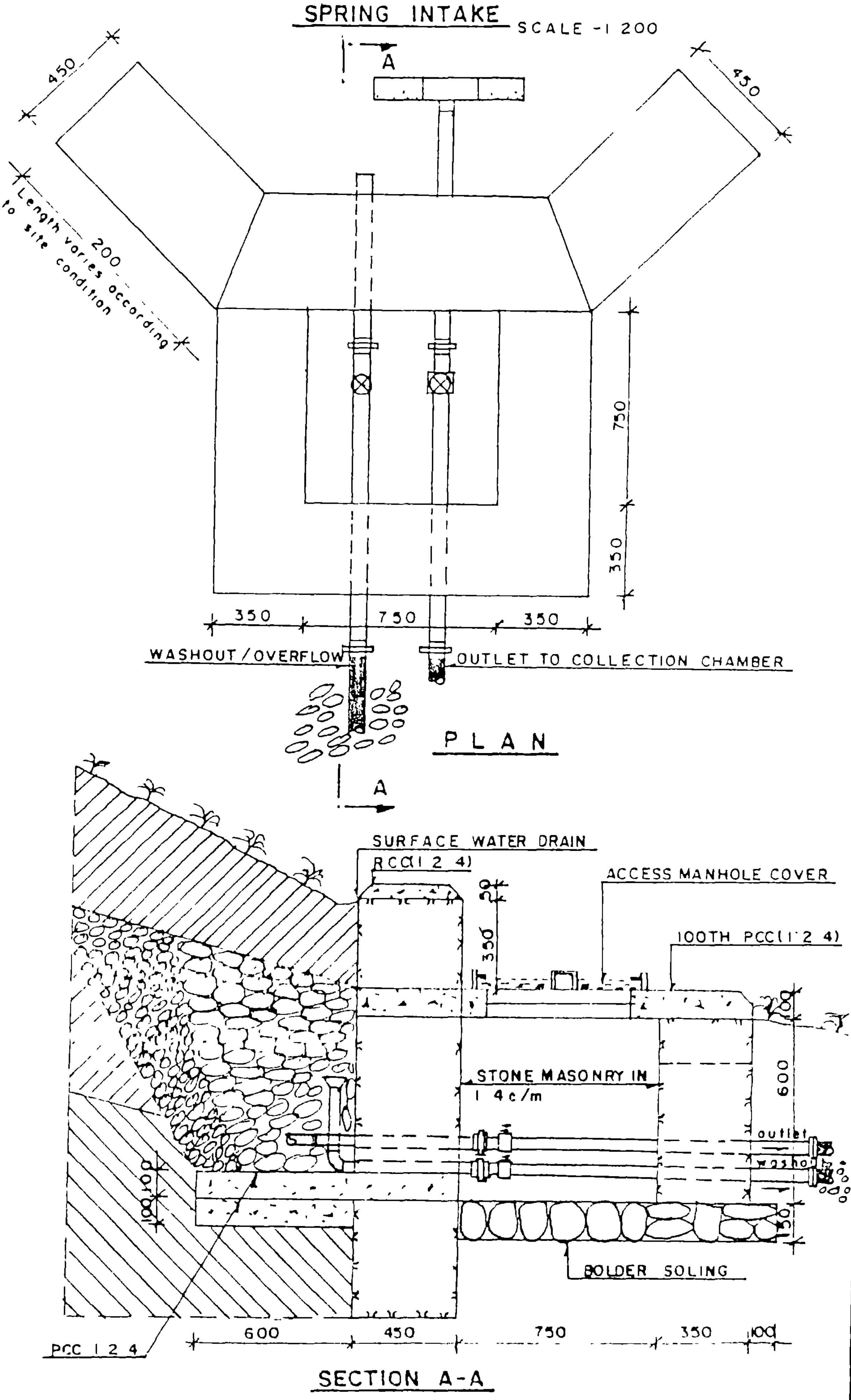
a Water supply construction	Amount (Rs or Persondays per household)
Cash contribution	
Skilled labor	
Unskilled labour for pipeline trench digging	
Unskilled labor for construction	
Local material	
Porterage	
b Operation & Maintenance Upfront cash contribution	
c. Sanitation construction	

47 Prefeasibility Team Members

	Name	Designation
1	____________________	____________________
2	____________________	____________________
3	____________________	____________________
4	____________________	____________________

Date of field visit ____________________
Name of organization. ____________________
Address ____________________

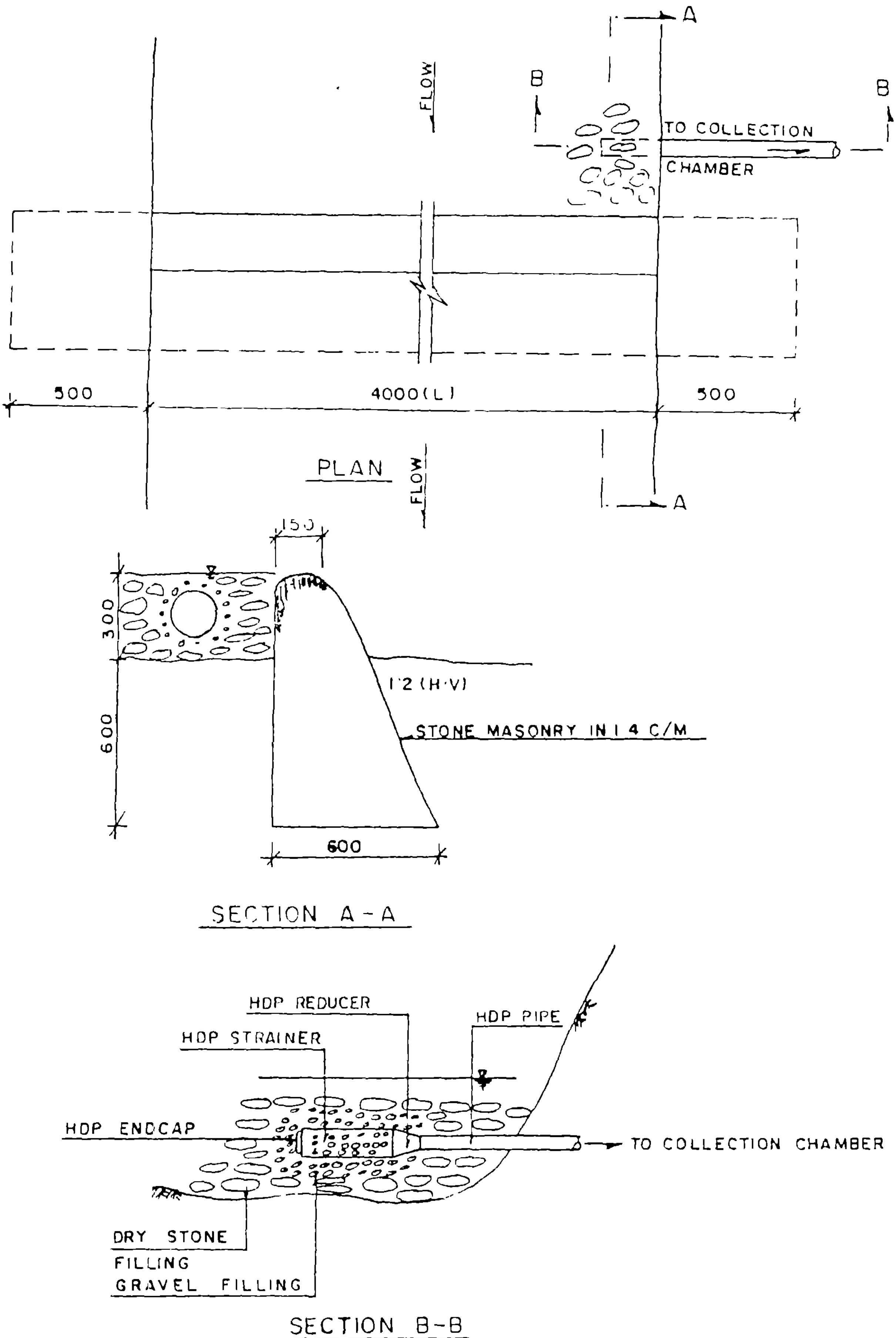
ANNEX 28


SPRING INTAKE
SCALE -1 200
A
450
450
200
Length varies according to site condition
750
350
350
750
350
WASHOUT / OVERFLOW
OUTLET TO COLLECTION CHAMBER
PLAN
A
SURFACE WATER DRAIN
RCC(1 2 4)
ACCESS MANHOLE COVER
50
350
100TH PCC(1 2 4)
100
600
STONE MASONRY IN
1 4 c/m
outlet
washout
100
100
150
BOLDER SOLING
PCC 1 2 4
600
450
750
350
100
SECTION A-A

Drawing No 1

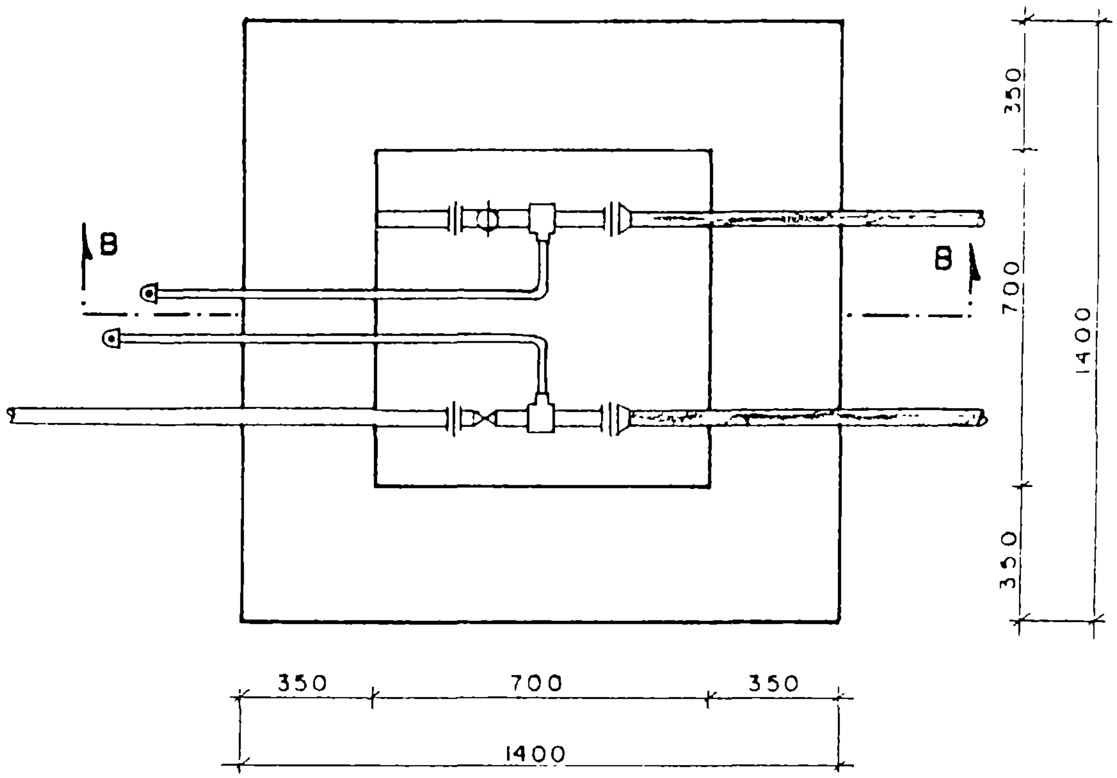
SPRING-FED STREAM INTAKE

SCALE - 1 200

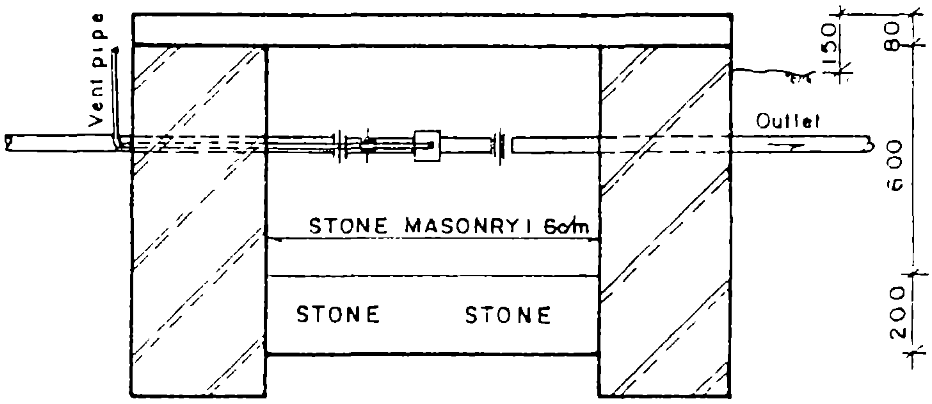


Drawing No 2

VALVE CHAMBER SCALE -1 200



PLAN

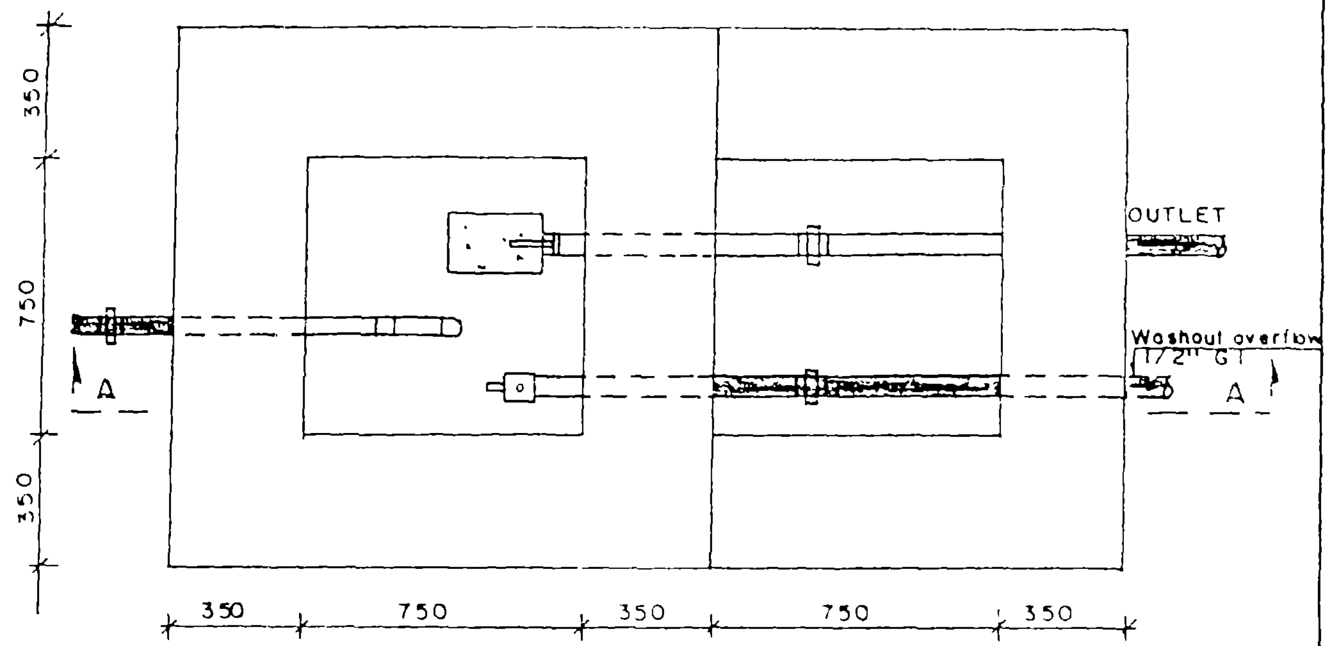


SECTION B - B

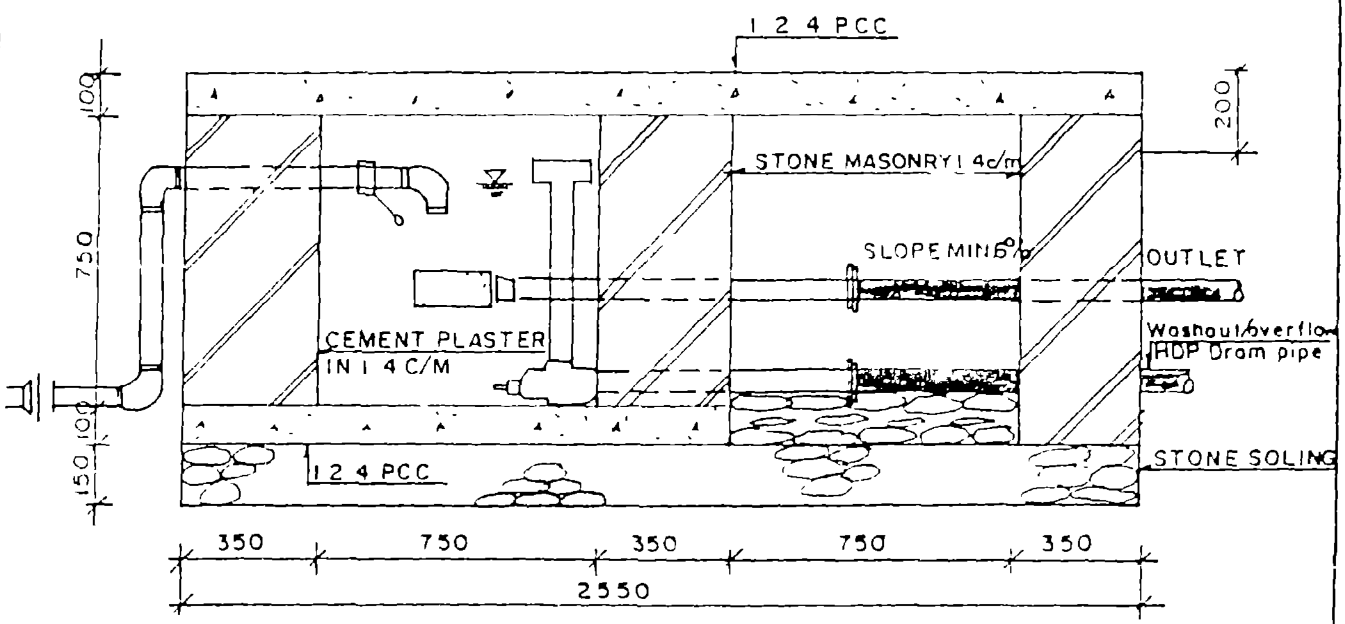
Drawing No 3

COLLECTION CHAMBER/INTRRUPTION CHAMBER
BPT'S/ DISTRIBUTION CHAMBER

SCALE -1 200

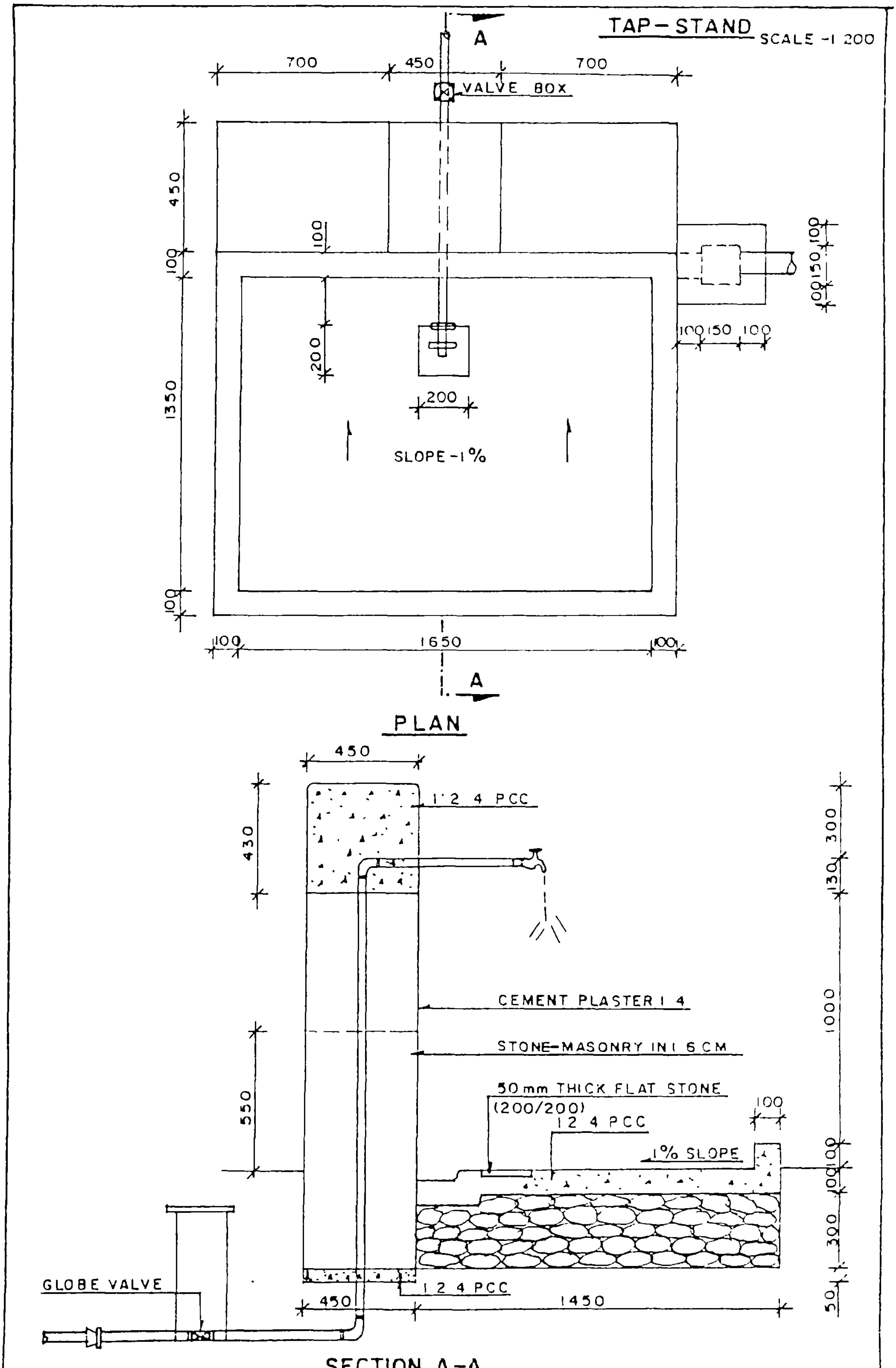


PLAN



SECTION 'A - A'

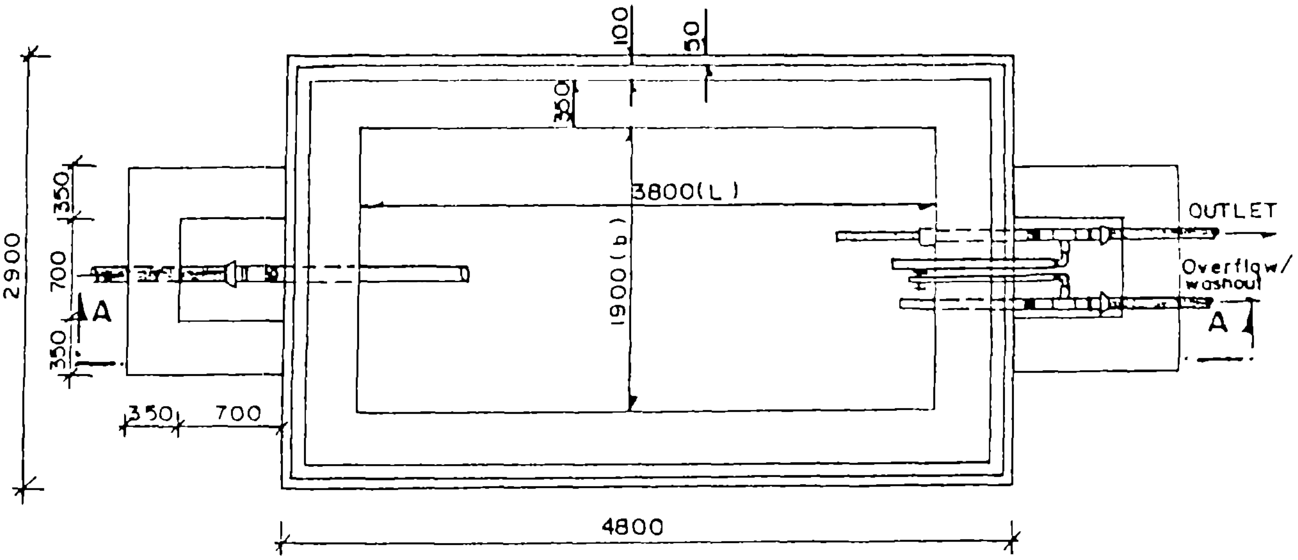
Drawing No 4


TAP-STAND
SCALE -1 200
VALVE BOX
SLOPE -1%
PLAN
1:2 4 PCC
CEMENT PLASTER 1 4
STONE-MASONRY IN 1 6 CM
50 mm THICK FLAT STONE (200/200)
1 2 4 PCC
1% SLOPE
GLOBE VALVE
1 2 4 PCC
SECTION A-A

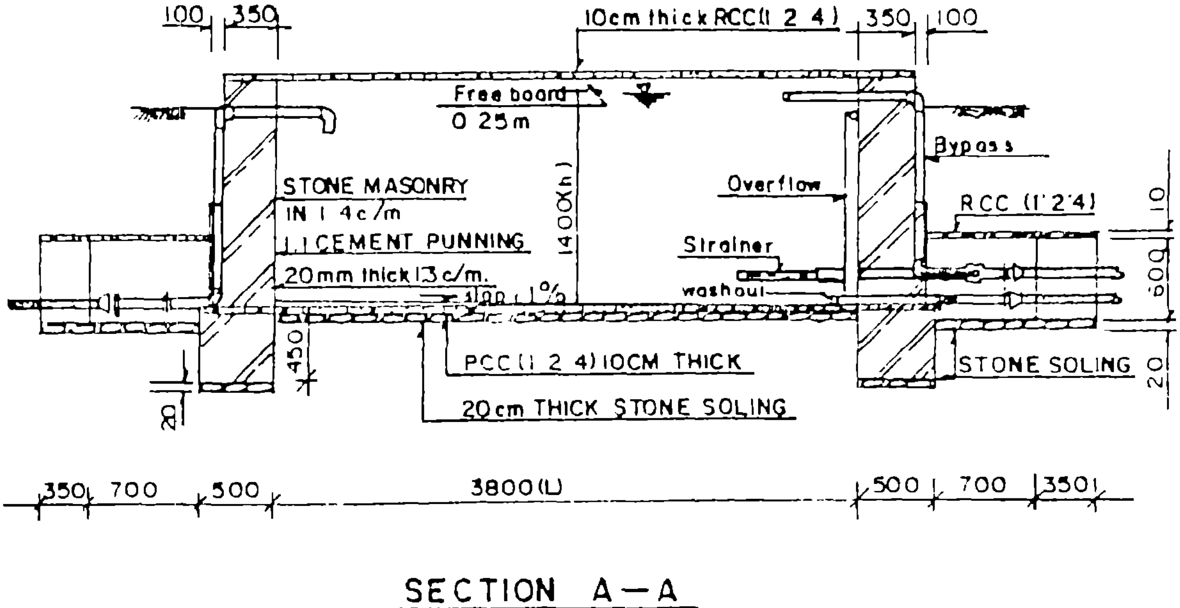
Drawing No 5

MASONRY RESERVOIR

SCALE:-1 500



PLAN

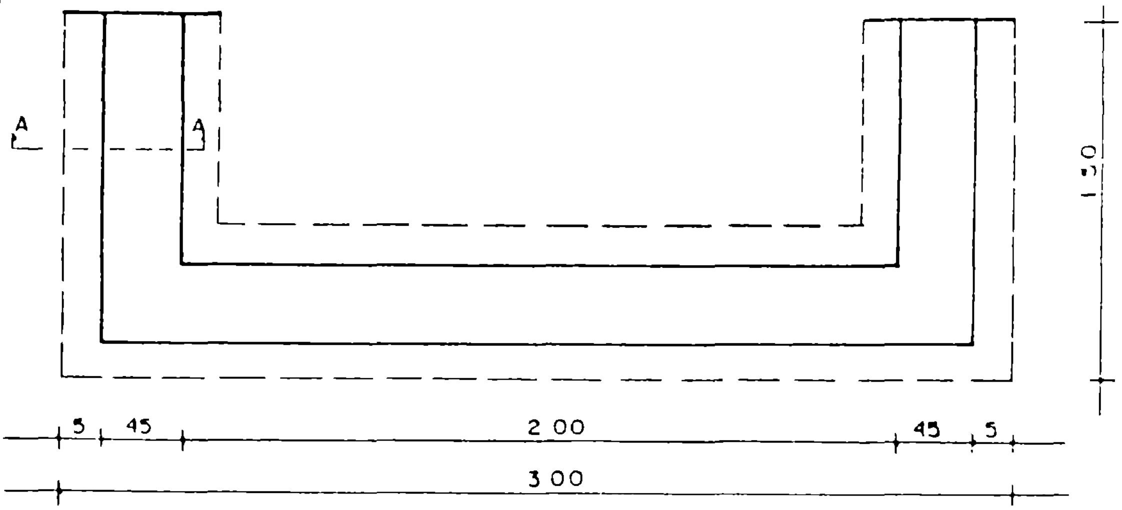


SECTION A—A

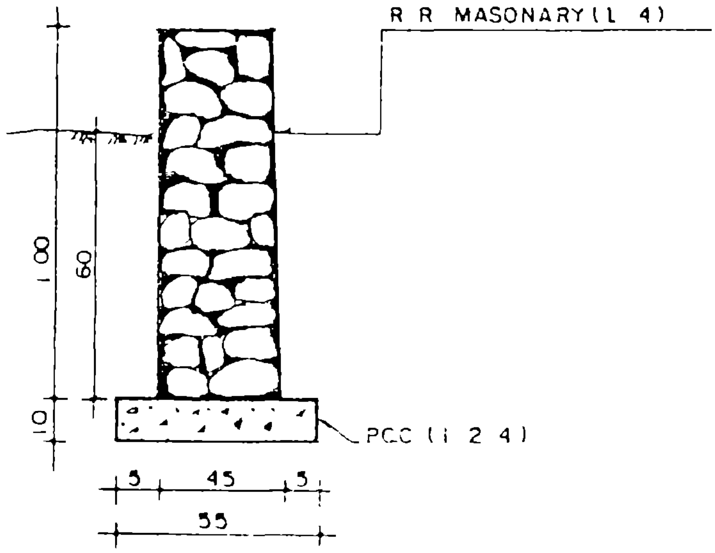
Drawing No 6

SPRING CATCHMENT INTAKE

(POINT SOURCE)



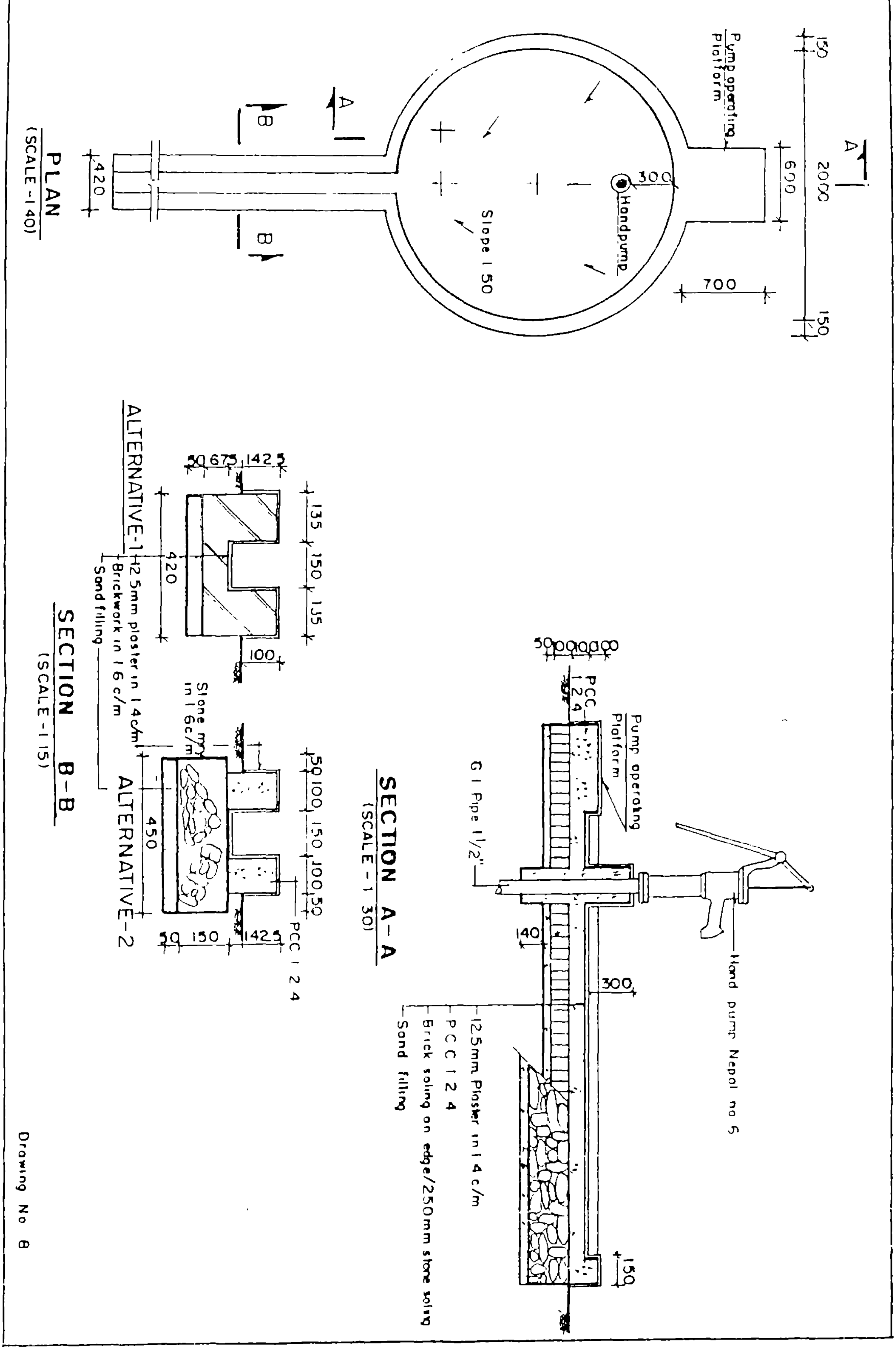
PLAN



SECTION - A-A

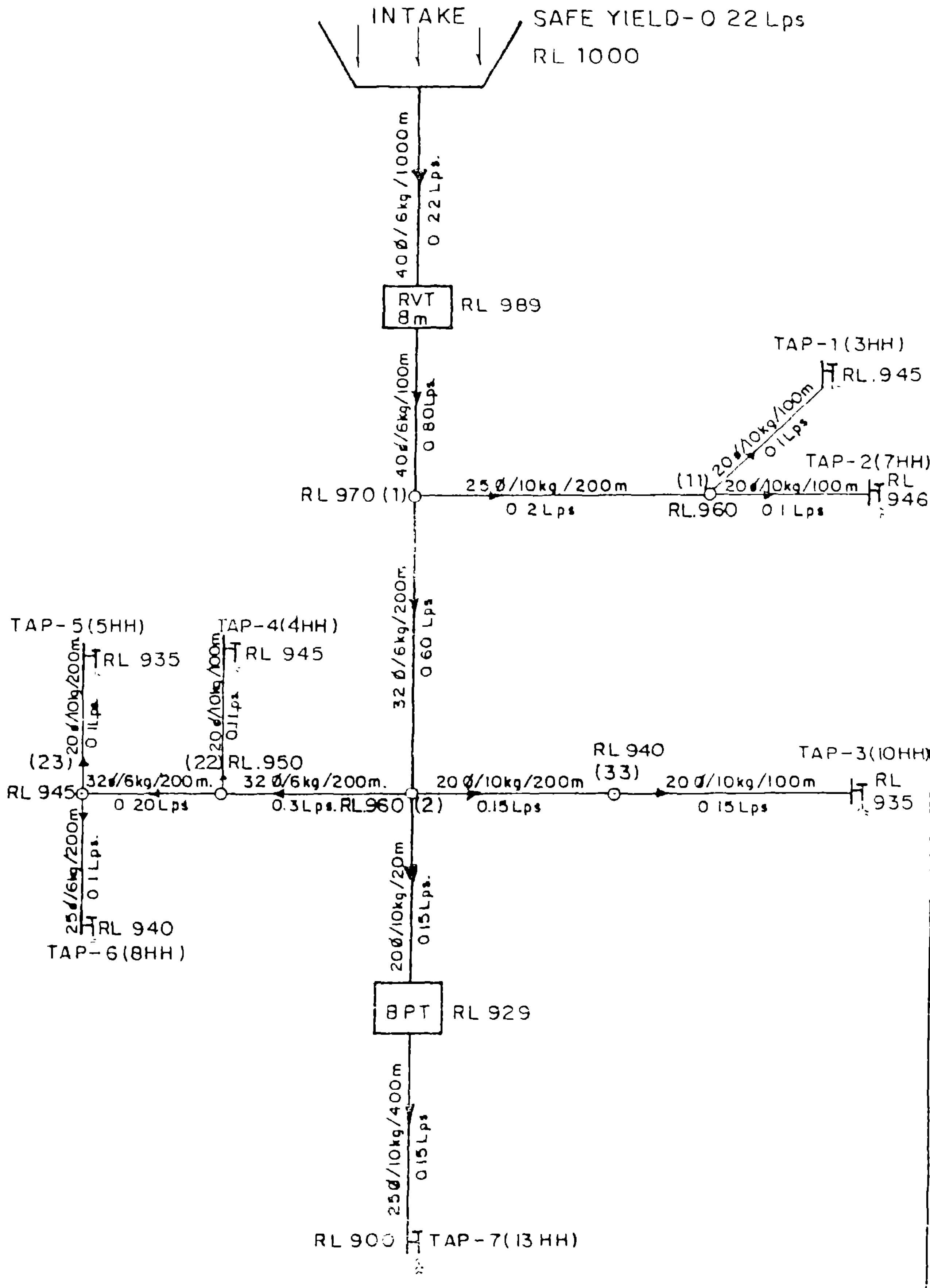
Drawing No 7

PLATFORM FOR SHALLOW TUBE - WELLS



LAY-OUT PLAN

(NOT TO SCALE)



Drawing No 9

ANNEX 29

THE RURAL WATER SUPPLY AND SANITATION PROJECT
ANNEX 29: CONSTRUCTION COST REPORTING FORM

ACTUAL CONSTRUCTION COST REPORTING FORM (Use a set of FORM – 1 to 7 for each scheme) FORM – 1 of 7

COST OF TRANSPORTATION OF MATERIALS UPTO ROADHEAD Pg 1 of 1

Total Weight of materials transported (Kg)

	Earthen Road	Gravelled Road	Metalled Road	Total
Km of Road Transported in a trip (Km)				
Nos of trips transported				
Means of Transportations				

Name of the VDC

Ward No

Name of village/community

Name of SO

Type of Scheme (Circle) Gravity/Spring Protection/STW/DTW DW

Date of Transportation Started Completed No of days

No	Particulars	Unit	Km (1)	No of Trips (2)	Total Km (3)=(1)*(2)	Quantity in Kg (4)	Total	Rate (Rs)	Amount (Rs)
	TRANSPORTATION BY TRUCK/BUS								
1	Earthen Road	Km							
2	Gravelled Road	Km							
3	Metalled Road	Km							
4	Total Road [1+2+3]	Km							
5	Loading Unloading	Trip							
6	Sub – Total [4+5]	Rs							
	TRANSPORTATION BY TRACTOR								
7	Earthen Road	Km							
8	Gravelled Road	Km							
9	Metalled Road	Km							
10	Total Road [7+8+9]	Km							
11	Loading Unloading	Trip							
12	Sub – Total [10+11]	Rs							
13	TRANSPORTATION BY OTHER MEANS (Specify)								
14	OTHER COST IF ANY (Specify)								
	GRAND TOTAL (Rs) [6+12+13+14]								

ACTUAL CONSTRUCTION COST REPORTING FORM (Use a set of FORM – 1 to 7 for each scheme) FORM – 2 of 7

COST OF UNSKILLED LABOUR FOR PORTERING OF MATERIALS FROM ROADHEAD TO SITE Pg. 1 of 1

Km of Road Materials are portered in a trip (Km): . . ..

Nos. of trips portered : ....

	Convenient materials	Inconvenient Materials	Total
Total Weight of materials transported (Kg)	....	....	....

Name of the VDC ... .

Ward No. ....

Name of village/community . .. .

Name of SO : ....

Type of Scheme (Circle) Gravity/Spring Protection/SHW/DTW/DW

Date of portering Started .. .. . . Completed .. .. No of days ..

No	Particulars	Unit	Quantities used by day																					Total	Rate	Amount
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		(Rs)	(Rs)
	UNSKILLED LABOUR FOR PORTERING																									
	Convenient Materials (like cement, fittings etc.)																									
1	Man	mandays																								
2	Woman	mandays																								
3	Sub–Total [1+2]	mandays																								
	Inconvenient Materials (like pipes, reinforcement bars etc.)																									
4	Man	mandays																								
5	Woman	mandays																								
6	Sub–Total [5+6]	mandays																								
7	Total [3+7]	mandays																								
8	Other cost if any (Specify)																									
	GRAND TOTAL (Rs) [7+8]																									

ACTUAL CONSTRUCTION COST REPORTING FORM (Use a set of FORM-1 to 7 for each scheme)

ACTUAL CONSTRUCTION COST OF SYSTEM COMPONENTS (Use a sheet for each type of component)

NAME OF COMPONENT	Size with unit (Length(m)/Breadth(m)/height(m))	NAME OF COMPONENT	Size with unit (Length(m)/Breadth(m)/height(m))
Intake		Reservoir Tank	
Collection Chamber		Break Pressure Tank	
Distribution Chamber		Valve Box	
Interruption Chamber		Tapstand	
Pipe Line		Suspended Crossing	
Latrine		Spring Protection	
Sludging/Drilling		Platform construction	
Pump Installation		Other component (specify)	

Name of the VDC ...

Ward No. ...

Name of village/community ...

Name of SO ·

Type of Scheme (Circle) . Gravity/Spring Protection STW/DTW/DW

Date of Construction Started ... Completed ... No of days ...

MARK ITEM OF WORK*1 ----->

No	Particulars	Unit	Quantity Used by day 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total Quantity	Rate (Rs)	Amount (Rs.)
	MATERIALS																									
1	Cement	bags																								
2	Reinforcement Bar																									
	6 mm	m																								
	8 mm	m																								
	10 mm	m																								
	12 mm	m																								
	Sub-Total	Rs.																								
3	HDPE Pipes (Specify pipe dia and Class)																									
		m																								
		m																								
		m																								
		m																								
		m																								
		m																								
		m																								
	Sub-Total	Rs.																								
4	GI Pipes (Specify pipe dia and Class)																									
		m																								
		m																								
		m																								
		m																								
	Sub-Total	Rs.																								
5	Tools and equipments (Specify)																									
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
	Sub-Total	Rs.																								

*1.Use following abbreviations: E=Earthwork; B=Backfilling; S=Soling, M=Masonry work; R=RCC; PC=PCC; PL=Plastering; PU=Punning; SL=Sludging/Drilling, P=Pump installatio

ACTUAL CONSTRUCTION COST REPORTING FORM (Use a set of FORM – 1 to 7 for each scheme) FORM – 3 of 7

COST OF UNSKILLED LABOUR FOR LOCAL MATERIALS COLLECTION Pg 1 of 1

	Sand	Stone	Agregate	Other Material (specify)
Distance the local material is available from site (km).				
Capacity of vessel used for portering (Cu.m):				

Name of the VDC ....

Ward No ....

Name of village/community ....

Name of SO : ....

Type of Scheme (Circle) . Gravity/Spring Protection/STW/DTW/DW

Date of portering .Started .... Completed .... No of days ....

No	Particulars	Unit	Quantities used by day 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total	Rate (Rs.)	Amount (Rs.)
	UNSKILLED LABOUR FOR LOCAL MATERIALS																									
	Sand seiving, collection and portering																									
1	Man	mandays																								
2	Woman	mandays																								
3	Sub – Total [1+2]	mandays																								
	No. of Trips collected	Nos																								
	Stone collection and portering																									
4	Man	mandays																								
5	Woman	mandays																								
6	Sub – Total [5+6]	mandays																								
	No. of Trips collected	Nos																								
	Agreegate making																									
7	Man	mandays																								
8	Woman	mandays																								
9	Sub – Total [7+8]	mandays																								
	Agreegate collection and portering																									
10	Man	mandays																								
11	Woman	mandays																								
12	Sub – Total [10+11]	mandays																								
	No. of Trips collected	Nos																								
13	Total labour [3+6+9+12]	mandays																								
14	Other local materials collected if any (Specify)																									
	GRAND TOTAL (Rs) [13+14]																									

RATE OF LOCAL MATERIALS (Calculation based on above table)

	Total Nos. of trip collected (1)	Capacity of Vessel used (2)	Total Cu.m. collected (3) = (1)*(2)	Total cost (from above table) based on manpower cost (4)	Any other cost if incurred (5)	Total Cost (Rs.) (6) = (4)+(5)	Rate per cu m. (7) = (6)/(3)
Sand							
Stone							
Agreegate							
Other local materials collected if any (specify)							

ACTUAL CONSTRUCTION COST OF SYSTEM COMPONENTS

NAME OF COMPONENT .

FORM – 4 of 7

Pg. 2 of 2

MARK ITEM OF WORK *1 ----->			Quantity Used by day																							
No	Particulars	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total Quantity	Rate (Rs.)	Amount (Rs.)
6	Pipe Fittings and Valves (Specify size and name of fitting)																									
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
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		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
		nos																								
	Sub – Total	Rs																								
7	Other materials (Specify)																									
	Sub – Total	Rs																								
8	Total Material (Rs) [1+2+3+4+5+6+7]																									
	LOCAL MATERIALS *2																									
9	Sand	cu m																								
10	Aggregates	cu m																								
11	Stone	cu m																								
12	Total Local Material (Rs) [9+10+11]																									
	SKILLED LABOUR																									
13	Skilled Labour	mandays																								
	UNSKILLED LABOUR																									
14	Man	mandays																								
15	Woman	mandays																								
16	Total Labour [14+15]	mandays																								
17	GRAND TOTAL (Rs.) [8+12+13+16]																									

*1 Use following abbreviations E=Earthwork, B=Backfilling; S=Soling, M=Masonry work; R=RCC, PC=PCC; PL=Plastering, PU=Pointing, SL=Sludging/Drilling, P=Pump installation

*2. Take cost from analysis of duly filled unskilled labour for local material (form – 3)

ACTUAL CONSTRUCTION COST REPORTING FORM (Use a set of FORM-1 to 7 for each scheme) FORM-5 of 7

COST OF TECHNICAL AND ADMINISTRATIVE INPUTS Pg 1 of 1

Name of the VDC .... Name of SO : ....

Ward No. .... Type of Scheme (Circle) : Gravity/Spring Protection/STW/DTW/DW

Name of village/community .... Date of construction .Started .... Completed .... No of days ....

			Quantities used by day																					Total	Rate	Amount
No	Particulars	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		(Rs.)	(Rs.)
	TECHNICAL MANPOWER																									
1	Technician	mandays																								
2	Sub-Overseer	mandays																								
3	Overseer	mandays																								
4	Engineer	mandays																								
5	Co-ordinator	mandays																								
6	Other manpower (specify)																									
		mandays																								
		mandays																								
		mandays																								
		mandays																								
		mandays																								
		mandays																								
		mandays																								
7	Sub-Total Manpower	Rs.																								
	Other Administrative expensed if any (Specify)																									
8	Sub-Total	Rs																								
	GRAND TOTAL (Rs) [7+8]																									

ACTUAL CONSTRUCTION COST REPORTING FORM (Use a set of FORM – 1 to 7 for each scheme)

SYSTEM COMPONENTS MEASUREMENT SHEET (Use a sheet for each type of component)

NAME OF COMPONENT : ...

Date of measurement ...

Name of the VDC ...

Ward No ...

Name of village/community ...

Measured by ...

Name of SO : ...

Type of Scheme (Circle) : Gravity/Spring Protection/STW/DTW/DW

Date of Construction :Started ... Completed ... No of days ...

Item No	Particulars of Item	No	Length m	Breadth m	Height m	Quantity m	Unit	Remarks

Note: 1. Include the items like Earthwork, Boulder soling, Rubble stone masonry work, Plastering, Cement Punning, Cement Pointing, RCC, PCC, formwork, Painting, Fencing, Earthfilling with detailed description of cement, sand and aggregate mix, thicknesses etc. as applicable

2. Provide sketch drawing in the back of the page

ACTUAL CONSTRUCTION COST REPORTING FORM (Use a set of FORM - 1 to 7 for each scheme)

ACTUAL CONSTRUCTION COST SUMMARY

COMPONENTS PROVIDED	Nos	COMPONENTS PROVIDED	Nos	COMPONENTS PROVIDED	Nos
Intake		Reservoir Tank		Transmission Pipeline	
Collection Chamber		Break Pressure Tank		Distribution Pipeline	
Distribution Chamber		Valve Box		Suspended crossing	
Interruption Chamber		Tapstand		No of Spring Protection	
[illegible]		No. of wells		Depth of Wells	

	Distance (Km)	Quantity (kg)		Distance (Km)
Porterage from Roadhead			Sand collection	
Transportation upto roadhead			Stone collection	
			Agregate collection	

Name of the VDC ....
Ward No ....
Name of village/community ....
Date of Report ....

Name of SO .... Beneficieries: Present .... Design(Future) ....
Type of Scheme (Circle) : Gravity/Spring Protection/STW/DTW/DW
Date of Construction : Started .... Completed .... No of days ....
Report filled by ....

S No	Item	Unit	Quantity Material	Quantity Men Labour	Quantity Women labour	Actual cost (Rs.) FUND	SO	COMMU-NITY	TOTAL	Remarks
	MATERIALS									
1	Cement	bags								
2	Reinforcement Bar									
3	Pipes									
4	GI Pipes									
5	Pipe Fittings and Valves									
6	Tools and equipments									
7	Other materials									
8	Total Material [1+2+3+4+5+6+7]	Rs.								
	LOCAL MATERIALS									
9	Sand	cu m.								
10	Aggregates	cu m								
11	Stone	cu.m								
12	Total Local Material [9+10+11]	Rs								
	SKILLED LABOUR									
13	Skilled Labour	mandays								
	UNSKILLED LABOUR									
14	Unskilled Labour for construction work	mandays								
15	Unskilled Labour for Pipeline	mandays								
16	Unskilled Labour for Local Materials	mandays								
17	Unskilled Labour for Porterage	mandays								
18	Total Unskilled Labour [14+. +17]	mandays								
	TRANSPORTATION									
19	Transportation from roadhead to site	Rs.								
	TECHNICAL MANPOWER AND OTHER ADMINISTRATION INPUTS									
20	Total construction supervision	Rs								
	OTHER COST if any (Specify)									
21										
22										
23										
24	Sub-Total other cost [21+. +24]	Rs								
	GRAND TOTAL (Rs.) [8+12+13+14+15+17+19+20+24]									

ANNEX 30

THE RURAL WATER SUPPLY AND SANITATION PROJECT
ANNEX 30: APPRAISAL FORM FOR IMPLEMENTATION PHASE PROPOSAL

1 Proposal Received date.... . . . .

2 Staff making assessment ....

3 Assessment made on . .. .

4 Name of SO ....

5 Project Name. ... ... VDC .. .. WN ... .

Check Criteria :

		Indicator	Criteria Met	Criteria Unmet	Remarks/Decision
1	Need Time Saving (min.)				
	Water Quality				
2 2.1	Technical Feasibility Source Adequacy Water yield (lpcd)				
2.2	Undisputed Source				
2 3	Water quality				
2.4	Design technically feasible				
2 5	User's choice made				
3 3.1	Sustainability : WUC Representative WUC (Nos)				
	Minority represented (Nos)				
	Women in WUC (Nos.)				
3.2	O&M Fund collected (%)				
3.3	Capital Contribution collected (%)				
3.4	Commitment for additional costs for high service if demanded.				
3.5	Complete coverage of community				

		Indicator	Criteria Met	Criteria Unmet	Remarks/ Decision
3.6	<u>Community contribution :</u> All Labour All Local Materials All Porterage				
	Community contribution in kind of total W/S cost in % % of total cost				
4	<u>Economic criteria :</u> **Per capita cost (design)** on W/s cost only				
	on Total software cost				
	on Total cost				
	B/C ratio on total cost on w/s cost only				
	ERR on total cost on w/s cost only				
5	<u>Environmental Soundness</u> Source Protection Drainage, Sullage				
8	<u>RECOMMENDATIONS</u>				

SITE APPRAISAL FOR IMPLEMENTATION PHASE

Scheme Name	VDC	Ward No
Present Population	Design Population	SO Name
Nos of HH by Ethnic Group		District

1. Existing Water Supply Situation (Need/Benefit)

	PROPOSAL ASSESSMENT						SITE APPRAISAL					
	1	2	3	4	5	6	1	2	3	4	5	6
Existing Sources Type in Use (Stream/Spring/Kuwa/TW/DW)												
Nos of HH using the source												
Appx Distance from farthest HH (m)												
Total time required for round trip including waiting time (min)												
Av Time required for community(min)												
Waiting time (min)												
Water Quality												
Discharge (lps) if possible												
Months source dries												
Nos of Trips per day												
Capacity of gagro/Vessel in use (lit)												

2. Technical Feasibility

2.1 Source (Adequacy/Quality/Availability)

	Proposed Source 1	Proposed Source 2	Alterante Source	Proposed Source 1	Proposed Source 2	Alternate Source
Type (Spring/Stream)						
Measured Flow (lps)						
Measured Date						
Safe Yield (lps)						
Adequacy (lpcd)						
Water Quality						
Is source undisputed	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Statement of WUC on undisputed source	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
If in Private land Name of owner						
Is there owners' agreement	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Reasons of Source Dispute If Exists						

2.2 Structures (Designs)

Profile (Yes/No) **Lay-out Plan (Yes/No)**

Source Protection Requirement		
Appropriateness of proposed Intake Structure		
Transmission Alignment	Elev at source (m) Total Pipe Length (m) Pipe Type,Dia , Pr Class & Length	

Pipe line pass through difficult zones	Yes/No Proposed Mitigation Measures	Yes/No Appropriateness of Measures
Rocky		
Dense Forest		
Stream/Gully Crossings		
Land slide		
Other Specify		

Reservoir Location (Elevation/Stability)	Res Capacity Elev. (m) Type Other info	
Reservoir Location Appropriate to serve community		
Reservoir Located in Stable Site		
Land owners agreement if applicable		
Problem of draining overflow water		
Other Specify		
Distribution Alignment Elevation at taps (m) Tap1 Tap5 Tap2 Tap6 Tap3 Tap7 Tap4 Tap8 Tap9	Elev at last tap (m) Total Pipe Length (m) Pipe Type,Dia ,& Pr Class	
Pipe line pass through difficult zones	Yes/No Proposed Mitigation Measures	Yes/No Appropriateness of Measures
Rocky		
Dense Forest		
Stream/Gully Crossings		
Land Slides		
Other Specify		
BPT/ IC Location	Elev (m) Distance (m)	

Nos of Tapstands, Is agreed		
Is Tapstand Location is agreed with community & women users		
Participation in Community Mapping		
Is Waste Water Drainage Problem Exist		

Design discussed and agreed with users		Yes/No	Yes/No	
Beneficiaries Comments on Tapstand Reservoir Others				

Sanitation General Sanitary Condition of Area		
Demand for Drainage		
Demand for Institutional Latrines		
Demand for HH Latrines		
Demand for other Sanitary facilities		

3. Sustainability

3.1 Water Users' Committee

Is Water Users' Committee formed	Yes/No	Yes/No
Total Nos of Members		
Nos of Women member		
Nos of members from minority groups		
Ethnic group in minority which represented WUC		
WUC regestration processed	Yes/No	
How WUC formed/ Is it representative		
Is Tapstand Group Formed	Yes/No	Yes/No

3.2 O&M Fund and Capital Contribution

O&M Fund Collected	Yes/No	
Amount Collected (Rs)		
Required Amount (Rs)		
Arrangement for future fund collection		
Capital Contribution collected	Yes/No	Yes/No
Amount (Rs)		
Required Amount (Rs)		

If full amount of O&M Fund and Capital contribution is not collected, When community expect it to be collected (date)

Is VMW selected	Yes/No		Yes/No	
			If No when?	

3 3 Community Commitment for Contribution

Labor		Yes/No	Yes/No
Materials		Yes/No	Yes/No
Sand			
Location			
Distance from Site (Km)			
Stone			
Location			
Distance from Site (Km)			
Aggregate			
Location			
Distance from Site (Km)			
Portrerage		Yes/No	Yes/No
Road Head Location			
Road Head Distance from Site (Km)			

Manpower

Availability of Skilled Labor	Locally/FromOutside		Locally/FromOutside
Wage Rate (Rs /md)			

Wage Rate of Unskilled Labour

		Construction	Agriculture
Men (Rs/md)			
Women (Rs /md)			
Portering (Rs /md)			

Is there demand for additional services (Like Private Connection Pls Describe)	Yes/No	Yes/No
Is community ready to pay additional cost	Yes/No	Yes/No
Is this acceptable to community	Yes/No	Yes/No

3.4 Coverage

Is All HH in Community Covered

Reasons for not including other adjoining area/HH's in this scheme (if any)

	Village Name	Ethnic Group	Appx No HH	Village Name	Ethnic Group	Appx No HH
Reasons						
Higher than source						
Low discharge						
No need of schemes						
Ethnic conflicts						
Others if any (Pls Specify)						

3.5 Adequecy/ Appropriateness of software activities

Undertake in DP	
-CAP	
-KAP	
-HSE	
-Sanitation	
-WUC Training	
- M&E	
- NFE	
- Others Specify	

Proposed in IP &PIP	
-CAP	
-HSE	
-Sanitation	
-WUC Training	
-VMW Training	
- Skill Dev Training	
-Mason's Training	
-M&E	
-Others Specify	

4. Economic Viability

Per Capita Cost (design) - W/s cost only (Hardware)		
- Total Software		
- Total Cost		
B/C ratio - Total Cost (Dev +Imp +Post)		
- W/s cost (Hardware)		
ERR - Total Cost (Dev +Imp +Post)		
- W/s cost (Hardware)		

5. Environmental Soundness

Adequacy of Environmental mitigation measures if required	

6. Comments/ Conclusions:

1. Need
Av Time Required for Round Trip incl waiting time
General Water Quality
Water adequacy

2 Technical Feasibility
2 1 Source Adequacy (lpcd)

2 2 Comments on design and costing system

3 Sustainability
3 1 1. WUC formed & representative
(Represented by women and minority group)

3 2 O&M Fund, Capital Contribution, Future O&M management

3 3 Community Contribution

3 4 Coverage
(Complete coverage of community)

3 5 Adequecy/ Appropriateness of Software activities
(implemented in DP and Proposed in IP& PIP)

4. Economic Viability

5 Environmental Soundness

6 Other comments if any

Site Appraisal Team Members
1
2
3 Date of site visit

ANNEX TABLES

Table 1 Summary of Cost Estimate for RWSS Project
(US$ '000)

Particulars	1995 Local	1995 Foreign	1995 Total	1996 Local	1996 Foreign	1996 Total	1997 Local	1997 Foreign	1997 Total
RWSS FUND	315 36	304 91	620 28	322 32	211 44	543 76	509 52	216 79	726 31
Capital Cost	78 10	90 39	168 49	2 40	0 00	2 40	2 40	0 00	2 40
Recurrent Cost	179 11	12 83	191 93	225 43	15 86	241 29	292 33	20 26	312 60
Institutional Development	58 16	201 70	259 86	94 50	205 58	300 08	214 79	196 53	411 31
WATER SUPPLY AND SANITATION	98 81	5 20	104 01	853 40	379 34	1232 73	1353 65	548 00	1901 66
A Pre-Development Phase									
Pre-Development Studies	5 71	0 30	6 01	7 99	0 42	8 41	11 42	0 60	12 02
B Development Phase									
Software	93 10	4 90	98 00	128 60	6 77	135 37	183 30	9 65	192 95
C Implementation Phase				716 80	372 15	1088 95	1001 84	519 83	1521 67
Water Supply				530 13	353 42	883 54	740 38	493 59	1233 97
Catchment Protection				12 28	0 65	12 93	17 12	0 90	18 02
Sanitation				18 33	9 87	28 20	25 69	13 83	39 52
Software				156 07	8 21	164 28	218 65	11 51	230 16
D Post Implementation Phase							157 09	17 93	175 02
Sanitation							19 88	10 71	30 59
Catchment Protection							4 91	0 26	5 17
Software							132 30	6 96	139 26
STUDIES	57 66	85 73	143 40	60 98	93 46	154 44	77 54	132 11	209 66
Total Base Cost	471 84	395 85	867 68	1236 70	694 24	1930 94	1940 71	896 91	2837 62
Physical Contingencies (10%)	47 1836	39 5847	86 76840	123 6696	69 4239	193 09	194 0709	89 69100	283 7619
Price Contingencies	33 7362	13 4984	47 23470	175 3511	48 8683	224 2195	419 7704	95 67637	515 4468
Total Project Cost	552 756	448 931	1001 687	1535 717	812 532	2348 249	2554 551	1082 277	3636 829

Particulars	1998 Local	1998 Foreign	1998 Total	1999 Local	1999 Foreign	1999 Total	2000 Local	2000 Foreign	2000 Total	Total Local	Total Foreign	Total Total	% Foreign Exchange	% Total Base Cost
RWSS FUND	566 70	138 39	705 09	348 32	51 01	419 33	399 67	38 50	438 17	2481 90	971 05	3452 94	28 12%	24 23%
Capital Cost	67 41	81 42	148 83	-2 40	0 00	2 40	-2 40	0 00	-2 40	155 09	171 81	[illegible]	52 56%	2 29%
Recurrent Cost	359 22	24 97	384 19	251 31	15 15	266 46	199 80	12 44	212 24	1507 21	101 50	1608 70	6 31%	11 29%
Institutional Development	140 08	32 00	172 08	114 61	33 86	150 47	197 47	26 07	223 54	819 60	697 74	1517 34	45 98%	10 64%
WATER SUPPLY AND SANITATION	1926 68	783 87	2710 56	2317 82	1075 50	3393 31	440 47	50 43	490 90	6990 83	2842 34	9833 17	28 91%	69 01%
A Pre-Development Phase														
Pre-Development Studies	15 99	0 84	16 83							41 11	2 16	43 27	5 00%	0 30%
B Development Phase														
Software	256 85	13 52	270 37							661 86	34 83	696 69	5 00%	4 89%
C Implementation Phase	1433 60	744 29	2177 90	2003 64	1039 64	3043 28	0 00	0 00	0 00	5155 89	2675 91	7831 80	34 17%	54 97%
Water Supply	1060 25	706 83	1767 09	1480 76	987 17	2467 93				3811 52	2541 01	6352 53	40 00%	44 59%
Catchment Protection	24 57	1 29	25 86	34 24	1 80	36 04				88 21	4 64	92 85	5 00%	0 65%
Sanitation	36 66	19 74	56 40	51 35	27 65	79 00				132 03	71 09	203 12	35 00%	1 43%
Software	312 12	16 43	328 55	437 29	23 02	460 31				1124 14	59 17	1183 30	5 00%	8 30%
D Post Implementation Phase	220 24	25 22	245 46	314 17	35 86	350 03	440 47	50 43	490 90	1131 98	129 43	1261 41	10 26%	8 85%
Sanitation	28 05	15 10	43 15	39 77	21 41	61 18	56 09	30 20	86 29	143 79	77 42	221 21	35 00%	1 55%
Catchment Protection	6 85	0 36	7 21	9 82	0 52	10 34	13 69	0 72	14 41	35 27	1 86	37 13	5 00%	0 26%
Software	185 35	9 76	195 10	264 58	13 93	278 51	370 69	19 51	390 20	952 92	50 15	1003 07	5 00%	7 07%
STUDIES	37 79	39 35	77 14	37 79	39 35	77 14	104 71	195 50	300 21	376 46	582 52	958 98	60 84%	6 75%
Total Base Cost	2531 17	961 62	3492 79	2723 92	1165 86	3889 78	944 84	284 44	1229 28	9849 18	4399 91	14249 09	30 87%	100 00%
Physical Contingencies (10%)	253 1171	96 16166	349 28	272 3924	116 5857	388 9781	94 48442	28 4437	122 93	984 91819	439 8908	1424 8090	30 87%	10 00%
Price Contingencies	747 3921	138 5499	885 9420	1032 344	212 9400	1245 287	441 9332	63 2613	505 1945	2850 5281	577 793	3428 3225	16 73%	24 05%
Total Project Cost	3531 680	1195 328	4728 008	4028 661	1495 393	5524 045	1481 262	376 142	1857 404	13684 628	5411 594	19096 222	28 34%	134 05%

(derived from Table 4-10)

Table 2 Summary of Cost Estimate with Contingencies for RWSS Project
(US$ '000)

Particulars	1995 Local	1995 Foreign	1995 Total	1996 Local	1996 Foreign	1996 Total	1997 Local	1997 Foreign	1997 Total
RWSS FUND	369.45	345.80	715.25	400.26	259.17	659.43	670.68	261.60	932.27
Capital Cost	91.49	102.51	194.00	2.98	0.00	2.98	3.15	0.00	3.15
Recurrent Cost	209.82	14.55	224.37	279.94	18.56	298.49	384.80	24.45	409.25
Institutional Development	68.14	228.75	296.88	117.35	240.61	357.96	282.72	237.14	519.86
WATER SUPPLY AND SANITATION	115.76	5.90	121.65	1059.74	443.97	1503.71	1781.81	661.26	2443.07
A Pre-Development Phase									
Pre-Development Studies	6.69	0.34	7.03	9.92	0.49	10.41	15.03	0.73	15.76
B Development Phase									
Software	109.07	5.56	114.62	159.70	7.92	167.62	241.28	11.64	252.[illegible]
C Implementation Phase				890.12	435.56	1325.68	1318.72	627.26	1945.98
Water Supply				658.30	413.64	1071.94	974.56	595.60	1570.16
Catchment Protection				15.25	0.76	16.01	22.53	1.09	23.62
Sanitation				22.76	11.55	34.31	33.81	16.69	50.50
Software				193.80	9.61	203.41	287.81	13.89	301.70
D Post Implementation Phase							206.78	21.63	228.41
Sanitation							26.17	12.92	39.09
Catchment Protection							6.46	0.31	6.78
Software							174.14	8.40	182.54
STUDIES	67.55	97.23	164.78	75.72	109.39	185.11	102.07	159.42	261.49
Total Project Cost	1552.756	448.931	1001.687	1535.717	812.532	2348.249	2554.551	1082.277	3636.829

Particulars	1998 Local	1998 Foreign	1998 Total	1999 Local	1999 Foreign	1999 Total	2000 Local	2000 Foreign	2000 Total
RWSS FUND	790.71	172.17	962.88	544.74	65.43	610.17	626.57	50.92	677.49
Capital Cost	94.05	101.29	195.34	3.54	0.00	3.54	3.76	0.00	3.76
Recurrent Cost	501.21	31.06	532.27	371.69	19.43	391.12	313.24	16.44	329.68
Institutional Development	195.45	39.82	235.26	169.51	46.00	215.51	309.58	34.47	344.05
WATER SUPPLY AND SANITATION	2688.25	975.20	3663.45	3428.03	1379.48	4807.51	690.54	66.69	757.23
A Pre-Development Phase									
Pre-Development Studies	22.31	1.05	23.36						
B Development Phase									
Software	358.38	16.82	375.20						
C Implementation Phase	2000.27	925.96	2926.23	2963.37	1333.49	4296.86			
Water Supply	1479.34	879.36	2358.70	2190.03	1266.19	3456.23			
Catchment Protection	34.28	1.61	35.89	50.64	2.31	52.95			
Sanitation	51.15	24.56	75.71	75.95	35.47	111.41			
Software	435.50	20.44	455.93	646.75	29.52	676.23			
D Post Implementation Phase	307.30	31.37	338.67	464.66	45.99	510.65	690.54	66.69	757.23
Sanitation	39.13	18.79	57.92	58.82	27.47	86.28	87.93	39.94	127.87
Catchment Protection	9.56	0.45	10.01	14.53	0.66	15.19	21.46	0.95	22.41
Software	258.61	12.14	270.74	391.32	17.86	409.18	581.14	25.80	606.94
STUDIES	52.72	48.96	101.68	55.88	50.48	106.36	164.15	258.53	422.69
Total Project Cost	3531.680	1196.328	4728.008	4028.661	1495.383	5524.045	1481.262	376.142	1857.404

Particulars	Total Local	Total Foreign	Total Total	% Foreign Exchange	% Total Cost
RWSS FUND	3402.41	1155.08	4557.4[illegible]	25.34%	23.86%
Capital Cost	198.98	203.80	402.7[illegible]	50.60%	2.11%
Recurrent Cost	2060.70	124.49	2185.1[illegible]	5.70%	11.44%
Institutional Development	1142.74	826.79	1969.5[illegible]	41.97%	10.31%
WATER SUPPLY AND SANITATION	9764.12	3532.51	13296.[illegible]	26.57%	69.63%
A Pre-Development Phase					
Pre-Development Studies	53.95	2.61	56.5[illegible]	4.61%	0.30%
B Development Phase					
Software	868.42	41.94	910.3[illegible]	4.61%	4.77%
C Implementation Phase	7172.48	3322.27	10494.7[illegible]	31.66%	54.96%
Water Supply	5302.24	3154.79	8457.0[illegible]	37.30%	44.29%
Catchment Protection	122.70	5.76	128.[illegible]	4.49%	0.67%
Sanitation	183.67	88.27	271.9[illegible]	32.46%	1.42%
Software	1563.86	73.46	1637.3[illegible]	4.49%	8.57%
D Post Implementation Phase	1669.27	165.69	1834.9[illegible]	9.03%	9.61%
Sanitation	212.05	99.11	311.1[illegible]	31.85%	1.63%
Catchment Protection	52.01	2.38	54.3[illegible]	4.37%	0.28%
Software	1405.21	64.20	1469.4[illegible]	4.37%	7.69%
STUDIES	518.10	724.01	1242.1[illegible]	58.28%	6.50%
Total Project Cost	13684.626	5411.594	19096.222	28.34%	100.00%

(derived from Table 1)

Table 3 Financing Plan for RWSS Project
(US$ '000)

Particulars	1995			1996			1997			1998			1999			2000			Total			% of Total
	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	
IDA	501 93	448 93	950 86	1091 90	812 53	1904 43	1886 94	1082 28	2969 22	2550 07	1196 33	3756 40	2660 31	1495 38	4155 69	1384 90	376 14	1761 04	10086 05	5411 59	15497 65	81 16%
HMG	50 82		50 82	119 89		119 89	186 76		156 76	243 67		243 67	287 65		287 65	96 36		96 36	985 15		985 15	5 16%
Community Contribution				323 93		323 93	480 85		480 85	727.94		727 94	1080 70		1080 70				2613 43		2613 43	13 69%
Water Supply				316 93		316 93	470 45		470 45	712 20		712 20	1057 34		1057 34				2556 92		2556 92	13 39%
In Cash				20 93		20 93	31 23		31 23	47 04		47 04	70 32		70 32				169 52		169 52	0 87%
In Kind				295 99		295 99	439 22		439 22	665 16		665 16	987 02		987 02				2387 40		2387 40	12 50%
Sanitation																						
In Kind				7 00		7 00	10 40		10 40	15 74		15 74	23 37		23 37				56 51		56 51	0 30%
Total Project Cost	552 756	448 931	1001 687	1535 717	812 532	2348 249	2554 551	1082 277	3636 829	3531 680	1196 328	4728 008	4028 661	1495 383	5524 045	1481 262	376 142	1857 404	13684 628	5411 594	19096 222	100 00%

(derived from Table 11 for community contribution & Table 1 for Total Project cost)

Table 4: Unit Costs

Particulars	Unit	1995	1996	1997	1998	1999	2000	Total	Unit Cost in 1993 (US$.000)	Unit Cost in 1995 (US$.000)	% Local	% Foreign	Local Excl. Tax	Duties & Taxes	Total
RWSS FUND															
Capital Cost															
A. Vehicles															
4WD Long Wheel Base	1	1			1			2	50.80	58.22	61.00%	39.00%			
Short Wheel Drive	1	1			1			2	14.40	16.44	58.00%	42.00%			
Sedan Car	1	1			1			2	13.20	15.07	58.00%	42.00%			
Motor Cycles	1	2			2			4	1.50	1.68	41.00%	59.00%			
B computer Equipment															
Computer(486 DX,24 DMG)	1	7			7			14	3.57	3.88	16.00%	84.00%			
Computer Software	1	1						1	3.00	3.33	33.00%	67.00%			
Network Boards	1	7			7			14	0.84	0.91	17.00%	83.00%			
Computer Printer(UPS)	1	7			7			14	0.20	0.22	15.00%	85.00%			
Laser Printer	1	1			1			2	2.40	2.61	16.00%	84.00%			
DOT Matrix Printer	1	2			2			4	1.20	1.30	16.00%	84.00%			
Plotter	1	1			1			2	2.00	2.17	16.00%	84.00%			
Photocopy Machine	1	1			1			2	3.30	3.63	27.00%	73.00%			
Generators	1	1			1			2	5.00	5.48	24.00%	76.00%			
Audio Visual Equipment	1	1						1	7.00	7.75	32.00%	68.00%			
Fax Machine	1	1			1			2	1.50	1.68	41.00%	59.00%			
C. Furniture and Fixtures															
Desks	1	12						12	0.16	0.19	92.00%	8.00%			
Chairs	1	40						40	0.04	0.05	92.00%	8.00%			
Sofa sets	1	2						2	0.24	0.29	92.00%	8.00%			
Filing Cabinets	1	10						10	0.20	0.24	92.00%	8.00%			
D Other assets															
Bicycle	1	3			3			6	0.04	0.04	17.00%	83.00%			
Electric Fans	1	8						8	0.10	0.11	39.00%	61.00%			
Kerosen heaters	1	8						8	0.03	0.03	32.00%	68.00%			
Calculators	1	6						6	0.03	0.03	41.00%	59.00%			
Emergency Lights	1	3						3	0.03	0.03	41.00%	59.00%			
Asset Purchase Provision	1	1	1	1	1	1	1	6	2.00	2.40	100.00%	0.00%			
Recurrent Cost															
A Staff Salaries															
Executive Staffs(5)	1	13	13	13	13	13	13	78	2.90	3.48	100.00%	0.00%			
Support Staffs(6)	1	13	13	13	13	13	13	78	1.68	2.01	100.00%	0.00%			
Lower Staffs(7)	1	13	13	13	13	13	13	78	0.16	0.19	100.00%	0.00%			

(derived from Table 12-26)

Table 4 Unit Costs (continue..)

Particulars	No. of Units: Unit	1995	1996	1997	1998	1999	2000	Total	Unit Cost in 1995 (US$ 000)	Unit Cost in 1995 (US$ 000)	% Local	% Foreign	Local Excl Tax	Duties & Taxes	Total
E Travel Allowance															
Daily Allowance	1	12	12	12	12	12	12	72	0.21	0.25	100.00%	0.00%			
Travel Allowance	1	12	12	12	12	12	12	72	0.04	0.05	50.00%	50.00%			
C. Office Operating Expenses															
Office Rent	1	12	12	12	12	12	12	72	0.80	0.96	100.00%	0.00%			
Water and electricity	1	12	12	12	12	12	12	72	0.15	0.18	100.00%	0.00%			
Insurance	1	12	12	12	12	12	12	72	0.04	0.05	100.00%	0.00%			
Printing and stationary	1	12	12	12	12	12	12	72	0.33	0.40	100.00%	0.00%			
Telex, Fax, Telephone	1	12	12	12	12	12	12	72	0.67	0.80	100.00%	0.00%			
Legal expenses	1	12	12	12	12	12	12	72	0.04	0.05	100.00%	0.00%			
Fuel expenses	1	12	12	12	12	12	12	72	0.65	0.70	10.00%	90.00%			
Board meeting costs	1	12	12	12	12	12	12	72	0.46	0.55	100.00%	0.00%			
postage	1	12	12	12	12	12	12	72	0.04	0.05	100.00%	0.00%			
Bank charges	1	12	12	12	12	12	12	72	0.04	0.05	100.00%	0.00%			
D Repairs and maintenance															
computer rep.& maint	1	12	12	12	12	12	12	72	0.10	0.11	40.00%	60.00%			
vehicle rep & maint.	1	12	12	12	12	12	12	72	0.20	0.24	100.00%	0.00%			
other rep & maint	1	12	12	12	12	12	12	72	0.15	0.18	100.00%	0.00%			
E Miscellaneous Expenses	1	12	12	12	12	12	12	72	0.50	0.60	100.00%	0.00%			
F. Pre-Development Site Appraisal	1	125	175	250	350			900	128.34	152.94	95.00%	5.00%			
G. Water Quality Test	1	125	175	250	350			900	64.00	74.96	80.00%	20.00%			
H. Monitoring and Supervision of Sub-Projects	1	125	300	550	775	600	350	2700	182.00	216.89	95.00%	5.00%			
Institutional Development															
A. RUSS Fund															
Training for Fund Staff	1	1	1	1	1	1	1	6	25.56	28.02	24.00%	76.00%			
Monit & Eval of Fund	1	1	1.5	2	2.5	3	3.5	13.5	4.40	5.27	100.00%	0.00%			
Impact Evaluation	1						1	1	120.00	143.81	100.00%	0.00%			
Technical Assistance	1	12	12	10				34	13.33	14.18	0.00%	100.00%			
Ind. Aud Eval.	1	1	3	15	5	8	3	35	9.00	10.60	85.00%	15.00%			
Publicity & Inf	1	1	1.5	1.65	3	3		10.15	3.90	4.62	90.00%	10.00%			

(derived from Table 12-26)

Table 4: Unit Costs (continue...)

Particulars	Unit	1995	1996	1997	1998	1999	2000		Unit Cost in 1993 (US$ 000)	Unit Cost in 1995 (US$ 000)	% Local	% Foreign	Local Excl Tax	Duties & Taxes	Total
	No. of Units														
B SO/SAs															
SOs Orientation	1	2	2	2	2	0	0	8	3.34	4.00	100.00%	0 00%			
Annual SOs & Fund Exc.Prog.	1	1	1.4	2	2 8	2 8	2.8	12.8	0 43	0.51	100.00%	0 00%			
M&E Training	1	2	2	2	2	0	0	8	0.81	0.97	100 00%	0 00%			
Management Dev Training	1	1	1	1	1	0	0	4	0.81	0.96	95.00%	5 00%			
Financial Management Training	1	1	1	1	1	0	0	4	0.92	1.10	95.00%	5 00%			
Technician Trg. on Survey Design	1	1	2	2	3	0	0	8	2 71	3.21	90 00%	10.00%			
Technician Trg.on Const. & Sup	1	0	1	2	2	3	0	8	1.28	1.52	90.00%	10.00%			
CFs Training	1	2	3	4	5	0	0	14	2 59	3 10	100.00%	0.00%			
HFs Training	1	2	3	4	5	0	0	14	3 42	4.09	100.00%	0 00%			
M&E Follow-up Training	1	0	2	2	2	2	0	8	0 81	0.97	100.00%	0.00%			
C Materials Adaptation & Dev.	1	1	1	1				3	10 00	11 04	30 00%	70.00%			
WATER SUPPLY AND SANITATION															
A.Pre-Development Phase															
Pre-Development Studies	1	125	175	250	350			900	40.34	48.07	95 00%	5.00%			
B.Development Phase															
Software	1	125	175	250	350			900			95 00%	5 00%			
C.Implementation Phase												85 00%			
Water Supply	1		125	175	250	350		900			60.00%	40.00%			
Catchment Protection	1		125	175	250	350		900	115.42	137.54	95.00%	5 00%			
Sanitation	1		125	175	250	350		900			65 00%	35.00%			
Software	1		125	175	250	350		900			95 00%	5 00%			
D.Post Implementation Phase															
Sanitation	1			125	175	250	350	900			65.00%	35 00%			
Catchment Protection	1			125	175	250	350	900			95.00%	5.00%			
Software	1			125	175	250	350	900			95.00%	5.00%			
STUDIES															
Health Impact Study	1	1	1	1	1	1	1	6							
In-Home Water Treatment	1	3	1	1				5	33 33	36 81	30 00%	70 00%			
Low cost techonology	1	1	1	1	1	1	1	6	20 00	22 09	30 00%	70 00%			
Detailed Demand Studies	1		1	1				2	10 00	11.04	30 00%	70.00%			
Polic.to Promote Pvt.sec	1			1				1	50.00	55.22	30.00%	70 00%			
Prepa. of follow up proj.	1						1	1	50 00	55 22	30.00%	70 00%			
Sector Monitoring Development	1	1	1	1	1	1	1	6	202 00	223 07	30 00%	70 00%			
									25 00	29.29	80.00%	20 00%			

(derived from Table 12-2b)

Table 5: Recurrent and Capital Cost of RWSS Fund

In US$ '000 Base Cost (1995)

Particulars	Unit	Unit Cost in 1993 (US$ 000)	Unit Cost in 1995 (US$ 000)	1995	1996	1997	1998	1999	2000	Total Local	Total Foreign	Total	% Foreign	% Taxes
RWSS FUND				620.28	543.76	726.31	705.09	419.33	438.17	2481.90	971.05	3452.94	28.12%	
Capital Cost				168.49	2.40	2.40	148.33	2.40	2.40	155.09	171.31	326.90	52.56%	
A. Vehicles				93.09	0.00	0.00	93.09	0.00	0.00	110.34	75.34	186.18	40.74%	
4WD Long Wheel Base	2	50.80	58.22	58.22	0.00	0.00	58.22	0.00	0.00	71.02	45.41	116.43	39.00%	
Short Wheel Drive	2	14.40	16.44	16.44	0.00	0.00	16.44	0.00	0.00	19.08	13.31	32.39	42.00%	
Sedan Car	2	13.20	15.07	15.07	0.00	0.00	15.07	0.00	0.00	17.49	12.66	30.15	42.00%	
Motor Cycles	4	1.50	1.68	3.36	0.00	0.00	3.36	0.00	0.00	2.75	3.96	6.71	59.00%	
B. computer Equipment				64.28	0.00	0.00	53.21	0.00	0.00	23.22	94.27	117.49	80.24%	
Computer(486 DX.24 DMG)	14	3.57	3.88	27.13	0.00	0.00	27.13	0.00	0.00	8.68	45.57	54.25	84.00%	
Computer Software	1	3.00	3.33	3.33	0.00	0.00	0.00	0.00	0.00	1.10	2.23	3.33	67.00%	
Network Boards	14	0.84	0.91	6.39	0.00	0.00	6.39	0.00	0.00	2.17	10.61	12.78	83.00%	
Computer Printer(UPS)	14	0.20	0.22	1.52	0.00	0.00	1.52	0.00	0.00	0.46	2.58	3.04	85.00%	
Laser Printer	2	2.40	2.61	2.61	0.00	0.00	2.61	0.00	0.00	0.83	4.38	5.21	84.00%	
DOT Matrix Printer	4	1.20	1.30	2.61	0.00	0.00	2.61	0.00	0.00	0.83	4.38	5.21	84.00%	
Plotter	2	2.00	2.17	2.17	0.00	0.00	2.17	0.00	0.00	0.69	3.65	4.34	84.00%	
Photocopy Machine	2	3.30	3.63	3.63	0.00	0.00	3.63	0.00	0.00	1.96	5.30	7.26	73.00%	
Generators	2	5.00	5.48	5.48	0.00	0.00	5.48	0.00	0.00	2.63	8.33	10.96	76.00%	
Audio Visual Equipment	1	7.00	7.75	7.75	0.00	0.00	0.00	0.00	0.00	2.48	5.27	7.75	68.00%	
Fax Machine	2	1.50	1.68	1.68	0.00	0.00	1.68	0.00	0.00	1.38	1.98	3.36	59.00%	
C. Furniture and Fixtures				7.13	0.00	0.00	0.00	0.00	0.00	6.56	0.57	7.13	8.00%	
Desks	12	0.16	0.19	2.28	0.00	0.00	0.00	0.00	0.00	2.10	0.18	2.28	8.00%	
Chairs	40	0.04	0.05	1.90	0.00	0.00	0.00	0.00	0.00	1.75	0.15	1.90	8.00%	
Sofa sets	2	0.24	0.29	0.57	0.00	0.00	0.00	0.00	0.00	0.52	0.05	0.57	8.00%	
Filing Cabinets	10	0.20	0.24	2.38	0.00	0.00	0.00	0.00	0.00	2.19	0.19	2.38	8.00%	
D Other assets				3.99	2.40	2.40	2.53	2.40	2.40	14.98	1.12	16.10	6.96%	
Bicycle	6	0.04	0.04	0.13	0.00	0.00	0.13	0.00	0.00	0.04	0.22	0.26	83.00%	
Electric Fans	8	0.10	0.11	0.39	0.00	0.00	0.00	0.00	0.00	0.35	0.54	0.39	61.00%	
Kerosen heaters	8	0.03	0.03	0.27	0.00	0.00	0.00	0.00	0.00	0.09	0.18	0.27	68.00%	
Calculators	6	0.03	0.03	0.20	0.00	0.00	0.00	0.00	0.00	0.08	0.12	0.20	59.00%	
Emergency lights	3	0.03	0.03	0.10	0.00	0.00	0.00	0.00	0.00	0.04	0.06	0.10	59.00%	
Asset Purchase Provision	6	2.00	2.40	2.40	2.40	2.40	2.40	2.40	2.40	14.38	0.00	14.38	0.00%	
Recurrent Cost				191.93	241.29	312.60	384.19	266.46	212.24	1507.21	101.50	1608.70	6.31%	
A Staff Salaries				73.84	73.84	73.84	73.84	73.84	73.84	443.04	0.00	443.04	0.00%	
Executive Staffs(5)	78	2.90	3.48	45.18	45.18	45.18	45.18	45.18	45.18	271.08	0.00	271.08	0.00%	

(derived from Table 12-26 & 4) (derived from Table 12-26 & 4)

Table 5 Recurrent and Capital Cost of RWSS Fund (continue....)
In US$ '000 Base Cost (1995)

Particulars	Unit	Unit Cost in 1993 (US$.000)	Unit Cost in 1995 (US$ 000)	1995	1996	1997	1998	1999	2000	Total Local	Total Foreign	Total	% Foreign	Taxes
Support Staffs(6)	78	1.68	2.01	26.17	26.17	26.17	26.17	26.17	26.17	157.04	0.00	157.04	0.00%	
Lower Staffs(7)	78	0.16	0.19	2.49	2.49	2.49	2.49	2.49	2.49	14.92	0.00	14.92	0.00%	
B Travel Allowance				3.56	3.56	3.56	3.56	3.56	3.56	19.75	1.63	21.38	7.62%	
Daily Allowance	72	0.21	0.25	3.02	3.02	3.02	3.02	3.02	3.02	18.12	0.00	18.12	0.00%	
Travel Allowance	72	0.04	0.05	0.54	0.54	0.54	0.54	0.54	0.54	1.63	1.63	3.26	50.00%	
C.Office Operating Expenses				45.36	45.36	45.36	45.36	45.36	45.36	226.79	45.38	272.18	16.67%	
Office Rent	72	0.80	0.96	11.50	11.50	11.50	11.50	11.50	11.50	69.03	0.00	69.03	0.00%	
Water and electricity	72	0.15	0.18	2.16	2.16	2.16	2.16	2.16	2.16	12.94	0.00	12.94	0.00%	
Insurance	72	0.04	0.05	0.58	0.58	0.58	0.58	0.58	0.58	3.45	0.00	3.45	0.00%	
Printing and stationary	72	0.33	0.40	4.75	4.75	4.75	4.75	4.75	4.75	28.47	0.00	28.47	0.00%	
Telex, Fax, Telephone	72	0.67	0.80	9.64	9.64	9.64	9.64	9.64	9.64	57.81	0.00	57.81	0.00%	
Legal expenses	72	0.04	0.05	0.58	0.58	0.58	0.58	0.58	0.58	3.45	0.00	3.45	0.00%	
Fuel expenses	72	0.65	0.70	[illegible]	8.40	8.40	8.40	8.40	8.40	5.04	45.38	50.42	90.00%	
Board meeting costs	72	0.46	0.55	[illegible]	6.62	6.62	6.62	6.62	6.62	39.69	0.00	39.69	0.00%	
postage	72	0.04	0.05	0.58	0.58	0.58	0.58	0.58	0.58	3.45	0.00	3.45	0.00%	
Bank charges	72	0.04	0.05	0.58	0.58	0.58	0.58	0.58	0.58	3.45	0.00	3.45	0.00%	
D Repairs and maintenance				6.37	6.37	6.37	6.37	6.37	6.37	33.42	4.83	38.25	12.62%	
computer rep & maint.	72	0.10	0.11	1.34	1.34	1.34	1.34	1.34	1.34	3.22	4.83	8.05	60.00%	
vehicle rep. & maint	72	0.20	0.24	2.88	2.88	2.88	2.88	2.88	2.88	17.26	0.00	17.26	0.00%	
other rep. & maint.	72	0.15	0.18	2.16	2.16	2.16	2.16	2.16	2.16	12.94	0.00	12.94	0.00%	
E Miscellaneous Expenses	72	0.50	0.60	7.19	7.19	7.19	7.19	7.19	7.19	43.14	0.00	43.14	0.00%	
F Pre-Development Site Appraisal	900	128.34	152.94	19.12	26.77	38.24	53.53			130.78	6.88	137.66	5.00%	
G.Water Quality Test	900	64.00	74.98	9.37	13.12	18.74	26.24			53.98	13.50	67.48	20.00%	
H.Monitoring and Supervision of Sub-Projects	2700	182.00	216.89	27.11	65.07	[illegible]	168.09	130.13	75.91	556.31	29.28	585.59	5.00%	

(derived from Table 12-26 & 4)

Table 5. Recurrent and Capital Cost of RWSS Fund (continue. ...)
In US$ '000 Base Cost (1995)

Particulars	Unit	Unit Cost in 1993 (US$.000)	Unit Cost in 1995 (US$.000)	1995	1996	1997	1998	1999	2000	Total Local	Total Foreign	Total	% Foreign	% Taxes
Institutional Development				259.86	300.08	411.31	172.08	150.47	223.54	819.60	697.74	1517.34	45.98%	
A. Staff Training and Monitoring				218.71	244.87	347.08	108.09	142.54	222.10	613.03	670.36	1283.39	52.[illegible]%	
Training for Fund Staff	6	25.56	28.02	28.02	28.02	28.02	28.02	28.02	28.02	40.35	127.77	168.12	76.00%	
Monit. & Eval. of Fund	13.5	4.40	5.27	5.27	7.91	10.55	13.18	15.82	18.46	71.18	0.00	71.18	0.00%	
Impact Evaluation	1	120.00	143.81	0.00	0.00	0.00	0.00	0.00	143.81	143.81	0.00	143.81	0.00%	
Technical Assistance	34	13.33	14.18	170.20	170.20	141.83	0.00	0.00	0.00	0.00	482.22	482.22	100.00%	
Ind. Aud. Eval	35	9.00	10.60	10.60	31.81	159.06	53.02	84.33	31.81	315.47	55.67	371.15	15.00%	
Publicity & Inf.	10.1	3.90	4.62	4.62	6.93	7.63	13.86	13.86	0.00	42.22	4.69	46.91	10.00%	
B. SO/SAs				30.10	44.17	53.18	64.00	7.94	1.44	196.63	4.19	200.83	2.09%	
SOs Orientation	8	3.34	4.00	7.99	7.99	7.99	7.99	0.00	0.00	31.97	0.00	31.97	0.00%	
Annual SOs & Fund Exc.Prog.	12.8	0.43	0.51	0.51	0.72	1.03	1.44	1.44	1.44	6.58	0.00	6.58	0.00%	
M&E Training	8	0.81	0.97	1.94	1.94	1.94	1.94	0.00	0.00	7.78	0.00	7.78	0.00%	
Management Dev. Training	4	0.81	0.96	0.96	0.96	0.96	0.96	0.00	0.00	3.65	0.19	3.84	5.00%	
Financial Management Training	4	0.92	1.10	1.10	1.10	1.10	1.10	0.00	0.00	4.18	0.22	4.40	5.00%	
Technician Trg. on Survey Design	8	2.71	3.21	3.21	6.42	6.42	9.63	0.00	0.00	23.10	2.57	25.67	10.00%	
Technician Trg.on Const. & Sup	8	1.28	1.52	0.00	1.52	3.04	3.04	4.55	0.00	10.93	1.21	12.14	10.00%	
CFs Training	14	2.59	3.10	6.20	9.29	12.39	15.49	0.00	0.00	43.37	0.00	43.37	0.00%	
HFs Training	14	3.42	4.09	8.19	12.28	16.37	20.46	0.00	0.00	57.30	0.00	57.30	0.00%	
M&E Follow-up Training	8	0.81	0.97	0.00	1.94	1.94	1.94	1.94	0.00	7.78	0.00	7.78	0.00%	
C. Materials Adaptation & Dev.	3	10.00	11.04	11.04	11.04	11.04	0.00	0.00	0.00	9.94	23.19	33.13	70.00%	

(derived from Table 12-26 & 4)

Table 6 Recurrent and Capital Cost of RWSS Fund
In US$ '000 with contingencies

Particulars	1995	1996	1997	1998	1999	2000	Local	Foreign	Total	Foreign	% Taxes
							Total				
RWSS FUND	715.25	659.43	932.27	962.88	610.17	677.49	3402.41	1155.08	4557.49	25.34%	
Capital Cost	194.00	2.98	3.15	195.34	3.54	3.76	198.96	200.80	402.78	50.60%	
A Vehicles	107.64	0.00	0.00	124.15	0.00	0.00	141.61	90.19	231.79	38.91%	
4WD Long Wheel Base	67.35	0.00	0.00	77.79	0.00	0.00	91.15	53.99	145.15	37.20%	
Short Wheel Drive	19.01	0.00	0.00	21.90	0.00	0.00	24.48	16.42	40.91	40.15%	
Sedan Car	17.42	0.00	0.00	20.07	0.00	0.00	22.44	15.06	37.50	40.15%	
Motor Cycles	3.86	0.00	0.00	4.38	0.00	0.00	3.53	4.71	8.24	57.14%	
B Computer Equipment	73.40	0.00	0.00	67.68	0.00	0.00	29.39	111.69	141.06	79.16%	
Computer(486 DX.24 DMG)	30.93	0.00	0.00	34.40	0.00	0.00	11.14	54.19	65.33	82.95%	
Computer Software	3.81	0.00	0.00	0.00	0.00	0.00	1.29	2.53	3.81	66.28%	
Network Boards	7.29	0.00	0.00	8.11	0.00	0.00	2.79	12.61	15.40	81.90%	
Computer Printer(UPS)	1.73	0.00	0.00	1.92	0.00	[illegible]	0.58	3.07	3.65	84.00%	
Laser Printer	2.97	0.00	0.00	3.30	0.00	0.00	1.07	5.20	6.27	82.95%	
DOT Matrix Printer	2.97	0.00	0.00	3.30	0.00	0.00	1.07	5.20	6.27	82.95%	
Plotter	2.48	0.00	0.00	2.75	0.00	0.00	0.89	4.34	5.23	82.95%	
Photocopy Machine	4.15	0.00	0.00	4.67	0.00	0.00	2.52	6.30	8.82	71.47%	
Generators	6.27	0.00	0.00	7.02	0.00	0.00	3.38	9.91	13.28	74.58%	
Audio Visual Equipment	8.88	0.00	0.00	0.00	0.00	0.00	2.90	5.98	8.88	67.29%	
Fax Machine	1.93	0.00	0.00	2.19	0.00	0.00	1.77	2.36	4.12	57.14%	
C. Furniture and Fixtures	8.33	0.00	0.00	0.00	0.00	0.00	7.68	0.65	8.33	7.76%	
Desks	2.66	0.00	0.00	0.00	0.00	0.00	2.46	0.21	2.66	7.76%	
Chairs	2.22	0.00	0.00	0.00	0.00	0.00	2.05	0.17	2.22	7.76%	
Sofa sets	0.67	0.00	0.00	0.00	0.00	0.00	0.61	0.05	0.67	7.76%	
Filing Cabinets	2.78	0.00	0.00	0.00	0.00	0.00	2.56	0.22	2.78	7.76%	
D Other assets	4.63	2.98	3.15	3.51	3.54	3.76	20.30	1.28	21.58	5.94%	
Bicycle	0.15	0.00	0.00	0.17	0.00	0.00	0.06	0.26	0.31	81.90%	
Electric Fans	1.03	0.00	0.00	0.00	0.00	0.00	0.41	0.62	1.03	60.23%	
Kerosen heaters	0.30	0.00	0.00	0.00	0.00	0.00	0.10	0.20	0.30	67.29%	
Calculators	0.23	0.00	0.00	0.00	0.00	0.00	0.10	0.13	0.23	58.21%	
Emergency Lights	0.12	0.00	0.00	0.00	0.00	0.00	0.05	0.07	0.12	58.21%	
Asset Purchase Provision	2.81	2.98	3.15	3.34	3.54	3.76	19.59	0.00	19.59	0.00%	
Recurrent Cost	224.37	296.49	409.25	532.27	391.12	329.68	2060.70	124.49	2185.19	5.70%	
A. Staff Salaries	86.50	91.69	97.19	103.03	109.21	115.76	603.38	0.00	603.38	0.00%	
Executive Staffs(5)	52.93	56.10	59.47	63.04	66.82	70.83	369.19	0.00	369.19	0.00%	

(derived from Table 5)

Table 6 Recurrent and Capital Cost of RWSS Fund (continued .)

In US$ '000 With contingencies

Particulars	1995	1996	1997	1998	1999	2000	Total Local	Total Foreign	Total	Foreign	% Taxes
Support Staffs(6)	30 66	32.50	34 45	36.52	38 71	41 03	213 88	0 00	213 88	0.00%	
Lower Staffs(7)	2.91	3 09	3 27	3 47	3 68	3 90	20 32	0 00	20.32	0 00%	
B. Travel Allowance	4.16	4 41	4 66	4 93	5 22	5 52	26 90	2.00	28.89	6.92%	
Daily Allowance	3 54	3.75	3 98	4 21	4.47	4 73	24 68	0 00	24 68	0 00%	
Travel Allowance	0.63	0 65	0 68	0 72	0 75	0 78	2 22	2 00	4 22	47 39%	
C Office Operating Expenses	52.86	55 79	58 88	62.15	65.61	69.26	308 88	55 67	364 55	15 27%	
Office Rent	13 48	14 29	15.14	16.05	17 02	18.04	94 01	0 00	94 01	0.00%	
Water and electricity	2 53	2.68	2.84	3.01	3 19	3 38	17.63	0 00	17 63	0.00%	
Insurance	0.67	0.71	0.76	0 80	0 85	0 90	4 70	0 00	4 70	0 00%	
Printing and stationary	5.56	5 89	6 25	6.62	7.02	7 44	38 78	0 00	38 78	0.00%	
Telex, Fax, Telephone	11 29	11 96	12 68	13 44	14.25	15 11	78.73	0.00	78 73	0 00%	
Legal expenses	0 67	0.71	0 76	0 80	0.85	0 90	4 70	0.00	4 70	0 00%	
Fuel expenses	9.56	9 90	10.23	10 58	10.94	11.32	6.87	55 67	62 54	89 02%	
Board meeting costs	7 75	8 21	8 71	9.23	9.78	10.37	54.06	0 00	54.06	0 00%	
postage	0.67	0.71	0 76	0 80	0.85	0 90	4 70	0.00	4 70	0 00%	
Bank charges	0 67	0.71	0 76	0.80	0 85	0.90	4.70	0 00	4.70	0 00%	
D Repairs and maintenance	7 44	7 86	8 30	8 77	9 27	9 80	45.51	5.92	51 44	11 52%	
computer rep.& maint.	1 54	1 61	1.68	1 75	1 83	1.91	4 38	5 92	10.31	57 47%	
vehicle rep. & maint.	3 37	3.57	3 79	4 01	4 25	4 51	23 50	0 00	23 50	0.00%	
other rep & maint	2.53	2.68	2 84	3.01	3 19	3.38	17.63	0 00	17 63	0.00%	
E Miscellaneous Expenses	8.42	8 93	9 46	10 03	10 63	11.27	58 76	0 00	58 76	0.00%	
F Pre-Development Site Appraisal	22 36	33 15	50 13	74.28	0 00	0.00	171 63	8.29	179 92	4 61%	
G. Water Quality Test	10 91	16 11	24.26	35 22	0 00	0.00	70 85	16 25	87 10	18 66%	
H. Monitoring and Supervision of Sub-Projects	31.71	80.56	156 36	233.25	191 18	118.08	774 79	36 36	811 15	4.48%	

(derived from Table 5)

Table 6: Recurrent and Capital Cost of RWSS Fund (continued...)

In US$ '000 With contingencies

Particulars	1995	1996	1997	1998	1999	2000	Total Local	Total Foreign	Total	Foreign	% Taxes
Institutional Development	296.88	357.96	519.86	235.26	215.51	344.05	1142.74	826.79	1969.53	41.97%	
A. Staff Training and Monitoring	248.99	290.01	436.28	146.18	203.86	341.79	872.55	794.56	1667.11	47.66%	
Training for Fund Staff	32.03	33.27	34.55	35.88	37.26	38.70	54.95	156.74	211.69	74.04%	
Monit. & Eval. of Fund	6.18	9.82	13.88	18.39	23.40	28.93	100.60	0.00	100.60	0.00%	
Impact Evaluation	0.00	0.00	0.00	0.00	0.00	225.45	225.45	0.00	225.45	0.00%	
Technical Assistance	193.02	199.20	171.14	0.00	0.00	0.00	0.00	563.36	563.36	100.00%	
Ind. Aud. Eval	12.36	39.16	206.76	72.78	122.97	48.70	434.03	68.71	502.73	13.67%	
Publicity & Inf	5.40	8.56	9.95	19.13	20.23	0.00	57.52	5.76	63.28	9.10%	
B. SO/SAs	35.25	54.78	69.89	89.08	11.65	2.36	257.83	5.08	262.91	1.93%	
SOs Orientation	9.36	9.93	10.52	11.15	0.00	0.00	40.96	0.00	40.96	0.00%	
Annual SOs & Fund Exc Prog	0.60	0.89	1.35	2.01	2.13	2.26	9.24	0.00	9.24	0.00%	
M&E Training	2.28	2.41	2.56	2.71	0.00	0.00	9.96	0.00	9.96	0.00%	
Management Dev Training	1.12	1.19	1.26	1.33	0.00	0.00	4.67	0.23	4.90	4.66%	
Financial Management Training	1.29	1.36	1.44	1.53	0.00	0.00	5.36	0.26	5.62	4.66%	
Technician Trg. on Survey Design	3.75	7.92	8.38	13.29	0.00	0.00	30.25	3.09	33.33	9.26%	
Technician Trg on Const & Sup.	0.00	1.87	3.96	4.19	6.65	0.00	15.17	1.51	16.67	9.05%	
CFs Training	7.26	11.54	16.31	21.61	0.00	0.00	56.72	0.00	56.72	0.00%	
HFs Training	9.59	15.25	21.55	28.55	0.00	0.00	74.93	0.00	74.93	0.00%	
M&E Follow-up Training	0.00	2.41	2.56	2.71	2.87	0.00	10.56	0.00	10.56	0.00%	
C. Materials Adaptation & Dev	12.65	13.16	13.69	0.00	0.00	0.00	12.36	27.14	39.50	68.72%	

(derived from Table 5)

Table 7: Water Supply and Sanitation Cost of RWSS Project
In US$ '000 Base Cost (1995)

Particulars	1995	1996	1997	1998	1999	2000	Total
PRE-DEVELOPMENT PHASE							
Pre-Development Studies	6.01	8.41	12.02	16.83			43.27
DEVELOPMENT PHASE							
Software	98.00	135.37	192.95	270.37			696.69
Gravity Scheme	64.68	90.76	128.97	181.13			465.53
Community Mobilization	24.61	34.56	49.21	69.12			177.49
HSE	10.71	15.04	21.42	30.09			77.27
NFE	17.16	24.02	33.94	47.67			122.79
WUC Training	12.20	17.13	24.39	34.26			87.98
Shallow Tubewells Scheme	23.26	32.95	45.76	65.89			167.86
Community Mobilization	6.91	9.95	13.82	19.91			50.59
HSE	3.01	4.33	6.02	8.67			22.02
NFE	9.92	13.73	19.07	27.46			70.17
WUC Training	3.43	4.93	6.85	9.87			25.08
Deep Tubewells Scheme	3.13	3.66	5.49	7.32			19.60
Community Mobilization	0.83	1.11	1.66	2.21			5.81
HSE	0.36	0.48	0.72	0.96			2.53
NFE	1.53	1.53	2.29	3.05			8.39
WUC Training	0.41	0.55	0.82	1.10			2.88
Dug wells Scheme	3.13	3.66	5.49	7.32			19.60
Community Mobilization	0.83	1.11	1.66	2.21			5.81
HSE	0.36	0.48	0.72	0.96			2.53
NFE	1.53	1.53	2.29	3.05			8.39
WUC Training	0.41	0.55	0.82	1.10			2.88
Spring Protection Scheme	3.81	4.35	7.25	8.70			24.10
Community Mobilization	1.38	1.66	2.77	3.32			9.12
HSE	0.60	0.72	1.20	1.44			3.97
NFE	1.14	1.14	1.91	2.29			6.48
WUC Training	0.69	0.82	1.37	1.65			4.52
Sub-Total (Development Phase)	104.01	143.78	204.97	287.19			739.95

(derived from Table 27-31 for software cost; Table 47-51 for water supply cost, and Table 69 for sanitation cost

Table 7: Water Supply and Sanitation Cost of RWSS Project (Continued...)
In US$ '000 Base Cost (1995)

Particulars	1995	1996	1997	1998	1999	2000	Total
IMPLEMENTATION PHASE							
Water Supply							
Hardware Cost		883.54	1233.97	1767.09	2467.93		6352.53
Gravity Scheme		709.69	996.76	1419.38	1993.52		5119.35
Shallow Tubewells Scheme		70.30	101.23	140.60	202.46		514.59
Deep Tubewells Scheme		52.72	70.30	105.45	140.60		369.07
Dug wells Scheme		35.15	46.87	70.30	93.73		246.05
Spring Protection Scheme		15.68	18.82	31.36	37.63		103.48
Catchment Protection		12.93	18.02	25.86	36.04		92.84
Gravity Scheme		12.24	17.19	24.48	34.39		88.30
Spring Protection Scheme		0.69	0.83	1.38	1.65		4.54
Sanitation							
Hardware Cost		28.20	39.52	56.40	79.00		203.12
Latrines for School and Health Post							
Gravity Scheme		19.27	27.08	38.53	54.11		138.98
Shallow Tubewells Scheme		6.33	9.12	12.67	18.24		46.35
Deep Tubewells Scheme		0.76	1.01	1.52	2.03		5.32
Dug wells Scheme		0.76	1.01	1.52	2.03		5.32
Spring Protection Scheme		1.08	1.30	2.17	2.60		7.14
Software		164.28	230.16	328.55	460.31		1183.30
Gravity Scheme		111.24	156.23	222.47	312.46		802.39
Community Mobilization		21.42	30.09	42.85	60.18		154.54
HSE		76.33	107.20	152.66	214.41		550.60
WUC Training		12.20	17.13	24.39	34.26		87.98
VMW Training		1.29	1.81	2.57	3.61		9.27
Shallow Tubewells Scheme		37.83	54.48	75.66	108.96		276.93
Community Mobilization		6.02	8.67	12.04	17.33		44.05
HSE		27.41	39.46	54.81	78.93		200.01
WUC Training		3.43	4.93	6.85	9.87		25.08
VMW Training		0.98	1.42	1.97	2.83		7.20
Deep Tubewells Scheme		4.48	[illegible]	8.96	11.95		31.37
Community Mobilization		0.72	0.96	1.44	1.93		5.06
HSE		3.29	4.39	6.58	8.77		23.02
WUC Training		0.41	0.55	0.82	1.10		2.88
VMW Training		0.06	0.08	0.12	0.16		0.41

(derived from Table 27-31 for software cost; Table 47-51 for water supply cost, and Table 69 for sanitation cost

Table 7: Water Supply and Sanitation Cost of RWSS Project (Continued. .)

In US$ '000 Base Cost (1995)

Particulars	1995	1996	1997	1998	1999	2000	Total
Dug wells Scheme		4.48	5 98	8.96	11.95		31.37
Community Mobilization		0.72	0.96	1.44	1.93		5 06
HSE		3 29	4 39	6 58	8.77		23.02
WUC Training		0.41	0 55	0.82	1.10		2.38
VMW Training		0.06	0.08	0.12	0 16		0.41
Spring Protection Scheme		6.25	7.50	12.50	15.00		41.24
Community Mobilization		1.20	1.44	2.41	2 89		7 94
HSE		4 29	5.15	8.58	10.29		28.30
WUC Training		0.69	0.82	1 37	1 65		4.52
VMW Training		0.07	0.09	0.14	0.17		0.48
Sub_Total (Implementation Phase)		1088.95	1521 66	2177 90	3043.28		7831.79

(derived from Table 27-31 for software cost; Table 47-51 for water supply cost, and Table 69 for sanitation cost.

Table 7. Water Supply and Sanitation Cost of RWSS Project (Continued ...)

In US$ '000 Base Cost (1995)

Particulars	1995	1996	1997	1998	1999	2000	Total
POST IMPLEMENTATION PHASE							
Sanitation							
Hardware Cost			30.59	43.15	61.18	86.29	221 21
Household Latrines							
Gravity Scheme			10 12	14.22	20.25	28 44	73.03
Shallow Tubewells Scheme			16.05	23.11	32 09	46.22	117 46
Deep Tubewells Scheme			1.93	2.57	3.85	5.14	13 48
Dug wells Scheme			1 93	2.57	3.85	5.14	[illegible]
Spring Protection Scheme			0.57	0.68	1 14	1 37	3.76
Catchment Protection			5.17	7.21	10 34	14 41	37 13
Gravity Scheme			4.90	6.88	9.79	13.75	35.32
Spring Protection Scheme			0.28	0.33	0.55	0.66	1 82
Software			139 26	195.10	278.51	390 20	1003.07
Gravity Scheme			93 88	131.86	187.77	263.72	677 23
Community Mobilization			18.88	26.52	37 76	53.03	136.18
HSE			54.94	77.16	109 88	154 32	396 30
Skill Development Training			[illegible]	28.18	40.13	56.37	144 75
Shallow Tubewells Scheme			32.34	46.56	64.67	93 13	236 70
Community Mobilization			5.30	7 64	10.61	15.27	38 82
HSE			21.40	30 81	42 79	61.62	156.62
Skill Development Training			5.64	8.12	11.27	16.23	41.26
Deep Tubewells Scheme			3.88	5.17	7.76	10 35	27 16
Community Mobilization			0.64	0 85	1.27	1 70	4.45
HSE			2.57	3.42	5.14	6 85	17.97
Skill Development Training			0.68	0.90	1.35	1.80	4.74
Dug wells Scheme			3.88	5.17	7.76	10 35	27 16
Community Mobilization			0.64	0 85	1 27	1 70	4 45
HSE			2.57	3 42	5.14	6 85	17 97
Skill Development Training			0 68	0.90	1.35	1 80	4.74
Spring Protection Scheme			5.27	6.33	10 55	12.66	34 81
Community Mobilization			1.06	1 27	2.12	2.55	7.00
HSE			3.09	3.70	6.17	7 41	20 37
Skill Development Training			1 13	1 35	2.26	2.71	[illegible]
Sub_Total(Post Implementation Phase)			175 02	245 45	350.03	490 90	1261.41
Total	[illegible]	[illegible]	1901 65	2710 54	3393 32	490 90	9833 15

Table 8 : Water Supply and Sanitation Cost of RWSS Project
In US$ '000 with contingencies

Particulars	1995	1996	1997	1998	1999	2000	Local	Foreign	Total	Foreign
WATER SUPPLY AND SANITATION	121.65	1503.71	2443.07	3663.45	4807.51	757.23	9764.12	3532 51	13296 63	26 57%
A. Pre-Development Phase										
Pre-Development Studies	7.03	10.41	15.76	23.36	0.00	0 00	53.95	2 61	56.55	4 61%
B. Development Phase										
Software	114.62	167 62	252.92	375 20	0.00	0.00	868.42	41.94	910.36	4.61%
C. Implementation Phase	0.00	1325 68	1945.98	2926.23	4296.86	0.00	7172.48	3322.27	10494.75	31.66%
Water Supply	0.00	1071.94	1570.16	2358.70	3456.23	0.00	5302.24	3154.79	8457.03	37.30%
Catchment Protection	0.00	16.01	23.62	35.89	52.95	0.00	122.70	5 76	128.47	4 49%
Sanitation	0.00	34.31	50.50	75.71	111.41	0.00	183 67	88.27	271.94	32 46%
Software	0.00	203.41	301 70	455.93	676.28	0.00	1563.86	73 46	1637 32	4.49%
D. Post Implementation Phase	0.00	0.00	228.41	338.67	510.65	757 23	1669.27	165 69	1834.96	9.03%
Sanitation	0.00	0.00	39.09	57.92	86.28	127 87	212.06	99.11	311.17	31.85%
Catchment Protection	0.00	0.00	6.78	10.01	15.19	22.41	52.01	2.38	54.39	4.37%
Software	0.00	0.00	182.54	270 74	409 18	606.94	1405.21	64 20	1469 41	4.37%

(derived from Table 7)

Table 7: Cost of Studies for RUSS Project
In US$ '000 Base Cost (1995)

Particulars	Unit	Unit Cost in 1993 (US$.000)	Unit Cost in 1995 (US$.000)	1995	1996	1997	1998	1999	2000	Total Local	Total Foreign	Total	% Foreign
STUDIES				143 40	154 44	209 66	77.14	77 14	300.21	376.46	585.52	961 98	60 86%
Health Impact Study	6	33 33	36 81	36 81	36.81	36 81	36 81	36.81	36 81	66 25	154 59	220.54	70 00
In-home Water Treatment	5	20 00	22 09	66 26	22 09	[illegible]	0 00	0 00	0 00	33 13	77 30	110 43	70 00%
Low cost technology	6	10.00	11 04	11 04	11 04	[illegible]	11 04	11 04	11 04	19 88	46 38	66.26	70 00%
Detailed Demand Studies	2	50 00	55.22	0 00	55 22	55 22	0 00	0.00	0 00	33 13	77 30	110 43	70 00%
Polic to Promote Pvt.sec	1	50 00	55 22	0 00	0 00	55 22	0 00	0 00	0 00	16.56	38 65	55 22	70.00%
Prepa. of follow up proj.	1	202 00	223.07	0 00	0 00	0.00	0 00	0.00	223 07	66.92	156 15	223.07	70 00%
Sector Monitoring Development	6	25 00	29 29	29 29	29 29	29 29	29 29	29.29	29 29	140 58	35 15	175 73	20.00%

Table 10. Cost of Studies for RWSS Project
In US$ '000 With contingencies

Particulars	1995	1996	1997	1998	1999	2000	Local	Foreign	Total	Foreign
									Total	
STUDIES	164.78	185.11	261.49	101.68	106 36	422 69	518 10	724 01	1242 10	58.25%
Health Impact Study	42.16	43 87	45.62	47 46	49.38	51 38	90 23	189 64	279.87	67.76%
In-Home Water Treatment	75.89	26.32	27.38	0 00	0.00	0.00	40 24	89.35	129.59	68.95%
Low cost technology	12.65	13 16	13.69	14.24	14 81	15 42	27.07	58 90	85 97	67.76%
Detailed Demand Studies	0.00	65.81	68.44	0 00	0.00	0 00	42 37	91.88	134 25	68.44%
Polic.to Promote Pvt.sec	0.00	0.00	68.44	0.00	0.00	0 00	21 80	46 64	68.44	68.14%
Prep. of follow up proj.	0.00	0.00	0.00	0.00	0.00	311 41	104.91	206 49	311.41	66 31%
Sector Monitoring Development	34.09	35.95	37.91	39 98	42.17	44 48	191.46	43 11	234 58	18.38%

(derived from Table 9)

Table 11· Cost Estimate of Community contribution (Base cost 1995 price)
In [illegible]

	Yr2	Yr3	Yr4	Yr5	Yrs Total	% of Total Cost
Water Supply	255.218	357.406	510.436	714.813	1837 374	28 93%
Gravity	217.875	306.005	435.751	612.009	1571 639	30.70%
Cash	4 968	6.977	9.936	13.955	35 835	0.70%
Kind	212.907	299.027	425 815	598.055	1535.804	30 00%
Spring	5.434	6 521	10.869	13.043	35.867	34 66%
Cash	0.103	0.124	0.207	0.248	0.683	0 66%
Kind	5.331	6.397	10 662	12.794	35.184	34 00%
Shallow	21 898	31.533	43.796	63.066	160.293	31 15%
Cash	8.541	12.299	17.083	24.599	62.522	12.15%
Kind	13.357	19.234	26.713	38 467	97.771	19 00%
Deep	2.868	3.824	5.736	7 648	20.077	5 44%
Cash	2.077	2.770	4.155	5.540	14.541	3.94%
Kind	0.791	1 054	1.582	2.109	5.536	1.50%
Dug	7.142	9.523	14.285	19.046	49.996	20.32%
Cash	1.167	1.556	2.334	3.112	8 169	3.32%
Kind	5.975	7.967	11 951	15.934	41 828	17.00%
Sanitation	5.640	7 900	11.280	15 800	620	9.57%
Kind						
Gravity	3.853	5 411	7.706	10.823	27.793	20.00% in School
Spring	0.216	0 260	0.433	0.519	1.429	20.00% HP
Shallow	1.266	1.824	2.533	3.647	9 271	20.00% Latrines
Deep	0.152	0.203	0.304	0.405	1.064	20.00%
Dug	0 152	0.203	0.304	0.405	1.064	20 00%
Total in Cash						
Water Supply	16.857	23.727	33.714	47.453	121.750	1 92%
Total in Kind	244.001	341.580	488 002	683 160	1756.743	25 92%
Water Supply	238 361	333.680	476 723	667 360	1716 123	27.01%
Sanitation	5.640	7 900	11.280	15.800	40.620	9 57%
Total	260.858	365.307	521.716	730.613	1878 494	27.72%

Table 12: Cost Estimate of Pre-Development Site Appraisal (For 6-schemes)
(for Recurrent cost of RWSS Fund - Table 5)

(1993 price)

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Allowance of Engineer and Program Officer				
	- Salary	2	10	1000	20000
	- TA	2		500	1000
	- DA	2	9	500	9000
	administration expenses				5000
	Sub Total				35000
	Add 10% running cost				3500
	Total				38500
	Cost per scheme				6417

Source: Consultant's Estimates.

Note : 10 days input of 2 person for a sub-project of 6 schemes is estimated

Table 13: Cost Estimate of Bacteriological Water Quality Test (for 6 schemes)
(for Recurrent cost of RWSS Fund - Table 5)

(1993 price))

S.N	Description	Quantity		Rate (NRs	Amount Rs
		Person	Sample/Day		
1	Sample Collection		25	200	5000
2	Test Charge		25	300	7500
3	DA	1	8	500	4000
4	TA			1000	1000
	Sub-Total				17500
	Add 10% Running costs				1750
	Total				19250
	Cost per scheme				3208

Source: Consultant's Estimates.

Note: In a visit 4 samples from each scheme (25 samples from 6 schemes) will be collected and for the whole test process it takes a week.

Table 14. Cost Estimate of Monitoring & Supervision of Sub-project (For 6-schemes)
(For Recurrent cost of [illegible] Table [illegible])

(1995 price)

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Allowance of Engineer and Program Officer				
	- Salary	2	45	1000	90000
	- TA	8		500	4000
	- DA	2	45	500	45000
	Logistic Support				10000
	Sub Total				149000
	Add 10% Running costs				14900
	Total Costs				163900
	Costs per evaluator				81950
	Cost per scheme				27317
	Cost per phase per scheme				9106

Source: Consultant's Estimates.

Note . 45 days input of two person (i.e. 15 days in each phase) is estimated for monitoring a sub-project of 6 schemes (i e. 5 days input in in each phase)

Table 15: Cost Estimate of Observation Study Tour for Fund Staff
(for Fund Staff Training cost of Cost of RWSS Fund Table 5)

(1993 price)

1 A/C	2 Particulars	3 No of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Executive Staffs				
	- TA	4		50000	200000
	- DA & other charges	4	15	12500	750000
	Total				950000
	Support Staff				
	- Fee	2	14	10000	280000
	- TA	2		10000	20000
	- DA	2	14	1000	28000
	Total				328000
	Grand Total Cost of Fund's Staff				1278000
	Cost per Executive Staff				237500
	Cost per day				
	Cost per Support Staff				164000
	Cost per day				

Source. Consultant's Estimates.

Table 16 Cost Estimate of Publicity and Information
(for Institutional Development Cost of RWSS Fund Table 5)

(1995 price)

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resources Person Allowance				
	- TA	2		500	1000
	- DA	2	7	500	7000
	Logistic Support				
	Total				8000
	Add 10% Running Costs				800
	Total Costs				8800
	Costs per evaluator				4400
	Cost per day				628.571

2 Visits and Public Meeting

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resources Person Allowance				
	- TA	2		500	1000
	- DA	2	4	500	4000
	Logistic Support				
	Total				5000
	Add 10% Running Costs				500
	Total Costs				5500
	Costs per evaluator				2750
	Cost per day				687 5

Source. Consultant's Estimates.

Table 17: Cost Estimate of Workshop for Orientation of SOs
(for Institutional Development Cost of RWSS Fund Table 5)
8 days Training for 30 participants

(1993 price)

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resources Person Allowance				
	- Salary	4	11	1000	44000
	- TA	4		500	2000
	- DA	4	8	500	16000
	Trainers Allowance				
	- TA	30		250	7500
	- DA	30	7	300	63000
	Materials Costs	30		400	12000
	Refreshments	40	8	20	6400
	Hall Charges		8	200	1600
	Sub Total				152500
	Add 10% M&E cost				15250
	Total Costs				167750
	Costs per participants				5592

Source: Consultant's Estimates.

Note : 3 days preparation for resource persons is considered.
Considering 2 person's participation from each new SO,
2 Orientation Workshop will be conducted each year

Table 18: Cost Estimate of Annual Fund-SO Exchange Program
(for Institutional Development Cost of RWSS Fund Table 5)

(1993 price)

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resources Person Allowance				
	- Salary				
	- TA				
	- DA				
	Trainers Allowance				
	- TA	30		250	7500
	- DA	30	1	300	9000
	Materials Costs				
	Refreshments	40	1	50	2000
	Field Trip Costs				
	Hall Charges				
	Sub Total				18500
	Add 10% Running costs				1850
	Total Costs				20350
	Costs per participants				678.333

Source. Consultant's Estimates.

Note. This is for annual review meeting of Fund-SO; One person from each SO will participate the meeting, 30 SO's is anticipated in first year there by incresed to 2 8 times in the 4th year.

Table 19: Cost Estimate of M&E Training for SO's
(for Institutional Development Cost of RWSS Fund Table 5)
5 days 30 participant

(1993 price)

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resources Person Allowance				
	- Salary	3	5	1000	15000
	- TA	3		500	1500
	- DA	3	4	500	6000
	Trainers Allowance				
	- TA	30		250	7500
	- DA	30	4	300	36000
	Materials Costs	30		500	15000
	Refreshments	35	5	20	3500
	Hall Charges		5	200	1000
	Sub Total				85500
	Add 10% M&E cost				8550
	Total Costs				94050
	Costs per participants				3135

Source Consultant's Estimates.

Note: Considering 2 participant from each SO's, two training will be organized in each year until 4th year

Table 20 Cost Estimate of Management Development Training of SOs
(for Institutional Development Cost of RWSS Fund Table 5)
3 days; 20 participants

(1993 price)

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per	6 Amount Rs
	Resources Person Allowance				
	- Salary	1	6	1000	6000
	- TA	1		500	500
	- DA	1	2	500	1000
	Trainers Allowance				
	- TA	20		250	5000
	- DA	20	2	300	12000
	Materials Costs	20		500	10000
	Refreshments	25	3	20	1500
	Hall Charges		3	200	600
	Sub Total				36600
	Add 10% Running costs				3660
	Total Costs				40260
	Costs per participants				2013

Source: Consultant's Estimates.

Note . One training will be arrange each year
This training is given to only those SO's who are weak in this area.

Table 21. Cost Estimate of Financial Management Training for SOs.
(for Institutional Development Cost of RWSS Fund Table 5)
5 days, 20 participants

1 A/C	2 Particulars	3 No of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resources Person Allowance				
	- Salary	1	7	1000	7000
	- TA	1		500	500
	- DA	1	4	500	2000
	Trainers Allowance				
	- TA	20		250	5000
	- DA	20	4	300	24000
	Materials Costs	20		75	1500
	Refreshments	20	5	20	2000
	Sub Total				42000
	Add 10% Running costs				4200
	Total Costs				46200
	Costs per participants				2310

Source. Consultant's Estimates.

Note : One training will be arrange each year
This training is given to only those SO's who are weak in this area.

Table 21: Cost Estimate of Financial Management Training for SOs
(for Institutional Development Cost of RWSS Fund Table 5)
5 days; 20 participants

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resources Person Allowance				
	- Salary	1	7	1000	7000
	- TA	1		500	500
	- DA	1	4	500	2000
	Trainers Allowance				
	- TA	20		250	5000
	- DA	20	4	300	24000
	Materials Costs	20		75	1500
	Refreshments	20	5	20	2000
	Sub Total				42000
	Add 10% Running costs				4200
	Total Costs				46200
	Costs per participants				2310

Source: Consultant's Estimates

Note : One training will be arrange each year.
This training is given to only those SO's who are weak in this area

Table 23: Cost Estimate of Technician Training on Construction Supervision of SOs
(for Institutional Development Cost of RWSS Fund Table 5)
6 days, 20 participants

(1993 price)

1 A/C	2 Particulars	3 No of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resources Person Allowance				
	- Salary	2	7	1000	14000
	- TA	2		500	1000
	- DA	2	6	500	6000
	Trainers Allowance				
	- TA	20		250	5000
	- DA	20	4	300	24000
	Materials Costs	20		200	4000
	Refreshments	25	6	20	3000
	Hall Charges		6	200	1200
	Sub Total				58200
	Add 10% Running costs				5820
	Total Costs				64020
	Costs per participants				3201

Source: Consultant's Estimates.

Note: This training is given to only those SO's who are weak in this area.

Table 24. Community Facilitators Training

(for Institutional Development Cost of RWSS [illegible] Table [illegible])

8 days Training for 20 participants

(1993 price)

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resources Person Allowance				
	- Salary	4	11	1000	44000
	- TA	4		500	2000
	- DA	4	8	-	16000
	Trainers Allowance				
	- TA	20		250	5000
	- DA	20	7	300	42000
	Materials Costs	20		400	8000
	Refreshments	25		20	500
	Hall Charges				
	Sub Total				117500
	Add 10% M&E cost				11750
	Total Costs				129250
	Costs per participants				32312.5

Source. Consultant's Estimates

Note . 3 days preparation for resource persons is considered.
Considering 1 CF can manage 3 to 4 schemes; In total 14 such training will be conducted within 4 year (Yr 1 to 4).

Table 25: H&SE Training for HF's
(for Institutional Development Cost or RWSS Fund Table 5)
14 days Training for 20 participants

(1993 price)

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resources Person Allowance				
	- Salary	3	14	1000	42000
	- TA	3		250	750
	- DA	3	13	300	11700
	Trainers Allowance				
	- TA	20		250	5000
	- DA	20	13	300	78000
	Materials Costs	20		400	8000
	Refreshments	25	14	20	7000
			14	200	2800
	Sub Total				155250
	Add 10% Running costs				15525
	Total Costs				170775
	Costs per participants				8538.75

Source: Consultant's Estimates.

Note: Considering 1 CF can manage 3 to 4 schemes; In total 14 such training will be conducted within 4 year (Yr 1 to 4)

Table 26 Cost Estimate of MRE follow-up Training for SO's

(for Institutional Development Cost of RWSS Fund Table 5)

2 days; 20 participants

(1995 price)

1 A/C	2 Particulars	3 No. of Persons	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resources Person Allowance				
	- Salary	3	2	1000	6000
	- TA	3		500	1500
	- DA	3	2	500	3000
	Trainers Allowance				
	- TA	20		250	5000
	- DA	20	2	300	12000
	Materials Costs	20		400	8000
	Refreshments	25	2	20	1000
	Hall Charges		2		400
	Sub Total				36900
	Add 10% Running costs				3690
	Total Costs				40590
	Costs per participants				2029.5

Source: Consultant's Estimates.

Table 27: Unit Schemes
(for Water Supply and Sanitation Cost Table 7)

	No. of Schemes				No. of Schemes with different activities.		
	Total	Dev. Phase	Imple Phase	Post Imple Phase	Community Mobilization		
					Dev.	Imp.	Post
Yr1 gravity	89	89			89	0	0
Spring	5	5			5	0	0
Shallow	25	25			25	0	0
Deep	3	3			3	0	0
Dug	3	3			3	0	0
Yr2 gravity	214	125	89		125	89	0
Spring	11	6	5		6	5	0
Shallow	61	36	25		36	25	0
Deep	7	4	3		4	3	0
Dug	7	4	3		4	3	0
Yr3 gravity	392	178	125	89	178	125	89
Spring	21	10	6	5	10	6	5
Shallow	111	50	36	25	50	36	25
Deep	13	6	4	3	6	4	3
Dug	13	6	4	3	6	4	3
Yr4 gravity	553	250	178	125	250	178	125
Spring	28	12	10	6	12	10	6
Shallow	158	72	50	36	72	50	36
Deep	18	8	6	4	8	6	4
Dug	18	8	6	4	8	6	4
Yr5 gravity	428		250	178	0	250	178
Spring	22		12	10	0	12	10
Shallow	122		72	50	0	72	50
Deep	14		8	6	0	8	6
Dug	14		8	6	0	8	6
Yr6 gravity	250			250	0	0	250
Spring	12			12	0	0	12
Shallow	72			72	0	0	72
Deep	8			8	0	0	8
Dug	8			8	0	0	8
Total	2700	900	900	900	900	900	900

Table 28 Cost Estimate of Pre-Development Studies of RWSS Sub-projects
(for 6 schemes)
(for Water Supply and Sanitation Cost Table 7)

(1993 price)

1 A/C	2 Particulars	3 No. of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Allowance of SOs				
	- TA	2		500	1000
	- DA	2	10	500	10000
	Sub Total				11000
	Add 10% running cost				1100
	Total				12100
	Cost per scheme				2017

Source. Consultant's Estimates.

Note: 2-weeks input of 2 persons for a sub-project of 6 scheme is estimated

Table 29 Software Cost for Gravity and Spring Protection Schemes (per scheme)
(In NRs)
(for Water Supply and Sanitation Cost Table 7)

For Average Scheme size of - 50 HH in Hills

(1993 price)

DEVELOPMENT PHASE

		With NFE
Community Mobilisation	11600	
Non-Formal Education		16000
WUC Members Training	5750	
HSE	10100	
Total	27450	43450

IMPLEMENTATION PHASE

	Imple.	Post Imple.	Total
Community Mobilisation	10100	8900	19000
Catchment Protection	5771	2308	8079
WUC Members Training	5750		5750
Maintenance workers Trainings	606		606
Skill Development Training for women		9460	9460
Hygience & Sanitation Education			
HSE	13800	13800	27600
Village Leaders/School Teachers/Social Workers	9478		9478
HSE Women groups Training	7150	7150	14300
HSE Exchange Visits	4950	4950	9900
Masons Training	606		606
Sub-Total	35984	25900	61884
Total	58211	46568	104779

Grand Total (Without NFE)	132229
Grand Total (With NFE)	138129 (Without HSE in Development Phase)

(derived from Table 32-43)

Table 30: Software Cost for Shallow Tubewell Schemes (per scheme)
(In NRs)
(for Water Supply and Sanitation Cost Table 7)

For Average Scheme size of · 100 HH in Terai

(1993 price)

DEVELOPMENT PHASE

		With NFE
Community Mobilisation	11600	
Non-Formal Education		32000
WUC Members Training	5750	
HSE	10100	
Total	27450	59450

IMPLEMENTATION PHASE

	Imple	Post Imple.	Total
Community Mobilisation	10100	8900	19000
WUC Members Training	5750		5750
Maintenance workers Trainings	1650		1650
Skill Development Training for Women		9460	9460
Hygiene & Sanitation Education			
HSE	13800	13800	27600
Village Leaders/School Teachers/Social Workers	9478		9478
HSE Motivators Training	17160	17160	34320
HSE Exchange Visits	4950	4950	9900
Masons Training	606		606
Sub-Total	45994	35910	81904
Total	63494	54270	117764

Grand Total (Without NFE)	145214
Grand Total (With NFE)	167114 (Without HSE cost in Development Phase)

(derived from Table 32-43)

Table 31: Software Cost for Deep Tubewell and Dugwell Schemes (per scheme)
(In NRs.)
(for Water Supply and Sanitation Cost Table 7)
For Average Scheme size of 100 HH in Terai

(1993 price)

DEVELOPMENT PHASE

		With NFE
Community Mobilisation	11600	
Non-Formal Education		32000
WUC Members Training	5750	
HSE	10100	
Total	27450	59450

IMPLEMENTATION PHASE

	Imple.	Post Imple.	Total
Community Mobilisation	10100	8900	19000
WUC Members Training	5750		5750
Maintenance workers Trainings	825		825
Skill Development Training for Women		9460	9460
Hygience & Sanitation Education			
HSE	13800	13800	27600
Village Leaders/School Teachers/Social Workers	9478		9478
HSE Motivators Training	17160	17160	34320
HSE Exchange Visits	4950	4950	9900
Masons Training	606		606
Water Quality Monitoring		6350	6350
Sub-Total	45994	35910	81904
Total	62669	54270	116939

Grand Total (Without NFE)	144389
Grand Total (With NFE)	166289 (Without HSE cost in Development Phase)

(derived from Table 32-43)

Table 32: Cost Estimate of Community Mobilization
(for software cost Table 29-31)

(1993 price)

DEVELOPMENT PHASE	Rate(NRs)	Unit	amount(NRs.)
Community Facilitator (per month)	2000.00	3	6000 00
Supervision DA (Person days)	600 00	6	3600.00
Supervision TA (No. of visits)	500 00	3	1500 00
Material & Suppliers (PRA/SARAR)			500 00
Total			11600 00

IMPLEMENTATION PHASE	Rate(NRs)	Unit	Amount(NRs.)
Community Facilitator (per. month)	2000.00	2	4000.00
Supervision DA (Person days)	600.00	6	3600 00
Supervision TA (No of visits)	500.00	4	2000.00
Material & Suppliers (PRA/SARAR)			500.00
Total			10100 00

POST-IMPLEMENTATION PHASE	Rate(NRs)	Unit	Amount(NRs.)
Community Facilitator (per. month)	2000 00	2	4000 00
Supervision DA (Person days)	600.00	4	2400.00
Supervision TA (No. of visits)	500.00	4	2000.00
Material & Suppliers (PRA/SARAR)			500.00
Total			8900.00

Table 33: Cost Estimate of HSE
(for Software Cost Table 29-31)

(1993 price)

DEVELOPMENT PHASE	Rate(NRs)	Unit	amount(NRs.)
Health Facilitator (per month)	2000.00	2	4000.00
Supervision DA (Person days)	600.00	6	3600.00
Supervision TA (No. of visits)	500.00	3	1500.00
Material & Suppliers (PRA/SARAR)			1000.00
Total			10100.00

IMPLEMENTATION PHASE	Rate(NRs)	Unit	Amount(NRs)
Community Facilitator (per month)	2000.00	3	6000.00
Supervision DA (Person days)	600.00	8	4800.00
Supervision TA (No. of visits)	500.00	4	2000.00
Material & Suppliers (PRA/SARAR)			1000.00
Total			13800.00

POST-IMPLEMENTATION PHASE	Rate(NRs)	Unit	Amount(NRs)
Community Facilitator (per month)	2000.00	3	6000 00
Supervision DA (Person days)	600.00	8	4800 00
Supervision TA (No. of visits)	500.00	4	2000.00
Material & Suppliers (PRA/SARAR)			1000.00
Total			13800 00

Source: Consultant's Estimate.

Table 34: Cost Estimate of WUC Members Training
(for Software Cost Table 29-31)

Course: : WUC Members trainings
No. of Trainee: 20
Period . 4 days

(1993 price)

S.N	Description	Quantity		Rate(NRs)	Amount (NRs)
		Person	Days		
1	Refreshment	25	4	75	7500
2	Travel Allowance				
3	Materials	20		150	3000
	Sub Total				10500
	Running Cost(10%)				1050
	Total				11550
	Cost Per Trainee (NRs)				578
	Cost per scheme per time				5750

Source: Consultant/s Estimate.

Note: The training will be given combining two WUC's. Two such training will be arranged, before and after implementation.

Table 35: Cost of Non-formal Education for Different Agencies
(for Software Cost Table 29-31)

Agency	Year	Description	No. of Class	Rate NRs.	Unit	Total Cost NRs.	Cost in 1993 price: Cost per Training	Cost per Participant	Cost per Participant Per day
NRCS		Books		68	person	2040			
		Stationary		62	person	1860			
		Teachers Allowance		20	day	2500			
		Petro/kerosene		L.s.		500			
		Others				1000			
	1992	Total	1			7900	8848	295	1.97
			2			18000	10080	336	
			1			10000	11200	373	
			1			8000	8960	299	
			2			13000	7280	208	
	1992	average	1				7728	252	1.68
NFESC		Reading Materials	2500	30	person	75000			
		Chalk	100	60	class	6000			
		Trainers wages	2	2000	month	52000			
		Facilitators allow	100	400	month	240000			
		Kerosene	80	10	class/lit	48000			
		(60 lit./class)	20	25	class/lit	30000			
	1992	Total	100			451000	5051	202	1 35
		Average	1				5051	202	1.35
LWS	1992		1				7840	314	2.09
HMG	1992		1				11928	477	3 18
Average			1				8137		0 89

Source: Different Sources

Table 36: Cost Estimate for Community Tree Plants for Catchment Protection
(for Software Cost Table 29)

Spacing 2.5 x 2.5 m = 1600 trees/ha
60% Survival Rate = 40% replanting in Year 2

(1993 price)

S.N	Description	Quantity			Amount (NRs)
		Plant/Ha.	Hectre	Rate(NRs)	
	Tree Plantation				
	Year 1	1600	5	0.72	5760
	Year 2	640	5	0.72	2304
	(40 % replanting)				
	Total				8064

Source: Based on Rapti Development Project Estimate (1991).

Note: This plantation will be arranged in implementaiton and post-implementation phase only in gravity scheme and spring protection schemes.

Table 37 Cost Estimate of HSE Training for Women's/Tapstand Group
(for software cost table [illegible])

Course Hygiene & Sanitation Women's/Tapstand Group

No. of Trainee: 25

Period 7 days

(1993 price)

S.N.	Description	Quantity		Rate(NRs)	Amount (NRs)
		Person	Days		
1	Refreshment	30	7	75	15750
2	Travel Allowance				
3	Materials	25		150	3750
	Sub Total				19500
	Running Cost(10%)				1950
	Total				21450
	Cost Per Trainee (NRs)				858
	Cost per scheme (Gravity/Spring Protection) per time				7150
	Cost per scheme (STW/DTW/DW) per time				17160

Source Consultant/s Estimate

Note In gravity/Spring schemes considering 8 participant from each scheme, a training will be given combining Participants from 3 schemes. In Well schemes 20 participants from each scheme will be trained in one training. This training will be given in Implementation Phase and similar training will be arranged in post-implementation phase as follow-up training

Table 38: Cost Estimate of Exchange Visit
(for software cost table 2.31)

Course: Exchange Visit (HSE)

No. of Trainee: 5

Period: 5 days

(1993 price)

S.N.	Description	Quantity			Amount (NRs)
		Person	Days	Rate(NRs)	
1	DA	5	5	100	2500
2	Travel Allowance	5		400	2000
	Sub Total				4500
	Running Cost(10%)				450
	Total				4950
	Cost Per Trainee (NRs)				990
	Cost per scheme per time				4950

Source: Consultant's Estimate

Note: This visit will be arranged two times, once in implementation phase and once in post-implementation phase in each scheme

Table 39 Cost Estimate of School Teachers/Opinion Leaders/TBA's HSE Training
(for Software Cost Table 52 51)

Course: School Teachers, Opention Leaders, Social Workers, TBA's, Training
No of Trainee: 25
Period: 8 days

(1993 price)

S.N	Description	Quantity		Rate(NRs)	Amount (NRs)
		Person	Days		
1	Refreshment	30	8	75	18000
2	Travel Allowance				
3	Materials	25		250	6250
4	TA Resource Persons		8	200	1600
	Sub Total				25850
	Running Cost(10%)				2585
	Total				28435
	Cost Per Trainee (NRs)				1137
	Cost per scheme				9478

Source Consultant's Estimate

Note Considering 8 participants from each scheme, participants from three schemes will be combined in this training

Table [illegible] Cost Estimate of Mason's Training
(for software cost table 29-31)

Course Mason's Training
No of Trainee 10
Period 2 days

(1993 price)

S N	Description	Quantity			Amount (NRs)
		Person	Days	Rate(NRs)	
1	Refreshment	14	2	77	2156
2	Materials	12		50	600
	Sub Total				2756
	Running Cost(10%)				275.6
	Total				3031 6
	Cost Per Trainee (NRs)				303
	Cost per scheme				606

Source Consultant's Estimate

Note: Two participants from each scheme is anticipated A training is arranged for 5 schemes

Table 41. Cost Estimate of Village Maintenance Workers Training (Hills)
(for Software Cost Table 29-31)

Course: . Village Maintenance Works Trainings
No. of Trainee 10
Period 2 days

(1993 price)

S N	Description	Quantity			Amount (NRs)
		Person	Days	Rate(NRs)	
1	Refreshment	14	2	77	2156
2	Materials	12		50	600
	Sub Total				2756
	Running Cost(10%)				275 6
	Total				3031 6
	Cost Per Trainee (NRs)				303
	Cost per scheme				606

Source Consultant's Estimate

Note Two maintenance worker from each gravity and spring protection scheme will participate in this training One training will be given combining participants of 6 schemes together.

Table 42. Cost Estimate of Village Maintenance Workers/Caretakers (Term ii)
(for Software Cost Table 29-31)

Course: Operation and Maintenace
No. o 20
Perio 1 days

(1993 price)

S N	Description	Quantity Person	Days	Rate(NRs)	Amount (NRs)
1	Refreshment	25	1	20	500
3	Materials	20		50	1000
	Sub Total				1500
	Running Cost(10%)				150
	Total				1650
	Cost Per Trainee (NRs)				83
	Cost per scheme				1650

Source Consultant's Estimate

Note: Two care taker from each well will participate in this training.
One training will be arranged for each of STW scheme and two schmes will be combined in case of DTW and DW schemes since nos of well in these will be about half that in STW schemes

Table 43: Skill Development Training for Women
(for Software Cost Table 29-31)
3 days; 20 participants

(1993 price)

1 A/C	2 Particulars	3 No of Person	4 Days/Unit	5 Rate Per Rs	6 Amount Rs
	Resource Person				
	- Salary	3	3	500	4500
	- TA				
	- DA				
	Trainers Allowance				
	- TA	20			
	- DA	20			
	Materials Costs	20		100	2000
	Refreshments	35	3	20	2100
	Hall Charges				
	Sub Total				8600
	Add 10% Running costs				860
	Total Costs				9460
	Costs per particıpnts				473

Source. Consultant's Estimates.

Note: 20 women from each scheme will be trained in post-implementation phase; This is on-site informative training so no allowance will be given to participants; Resource persons from relevant agencies working in the area will be utilized.

Table 44: Assumptions for Typical Gravity Scheme in hill
(for cost estimate of gravity scheme Table 47)

Present Population	300 (50HH)	
Future Population	390 (20 years)	
Growth Factor	1.3	
Design Period	20 years	
Demand	45 lpcd	
Safe Yield	0.22 lps	
Daily Demand	17550 lpd	
Taps	7 taps	Total flow demand is 0.825 lps considering peak factor of 3.75; in average 7 HH per tap
Reservoir	7-8 m3	Reservoir capacity required is 42% of daily demand.
Pipe Line		
Transmission	500-1000 m 32 mm dia. 6 Kg. HDPE	Considering av. 60 m level difference and
Distribution	2000-2500 m 40 mm dia. 6 Kg. HDPE	maximum static head V=0.4 m/s; HL=10.3 m/Km.
Intake	Spring or Spring fed stream (4m length)	
Collection Tank/ Sedimentation Tank	1 No.	
Interuption/BPT/ Distribution Chamber	1 No.	
Sectional Valve/ Air valve/Wash out	2 No.	
Truck Transportation	200 Km	
Roadhead to site	13 Km	
Site for Stone	200 m	
Site for Sand	2 Km	
Weight of materials		
Convenient	3 ton	
Inconvenient	1 ton	

Table 45: Assumptions for Typical Well Scheme in Terai (for cost estimate of well schemes Table 48-50)

Present Population	600 (100HH)
Future Population	1020 (20 years)
Growth Factor	1.7
Design Period	15 years
Demand	45 lpcd
Hand Pump	8 Nos. (Shallow TW Scheme) 135 design population per well; 12-13 HH per TW 5 Nos. (Deep TW and Dugwell Schemes) 204 design population per well; 20 HH per TW
Handpump Type	Nepal No. 6 (Shallow TW Schemes) INDIA Mark III (Deep TW & Dugwell Schemes)
Depth of Drilling	40 m (Shallow TW Schemes) 35 m (Deep TW schemes)
Drilling Method	Sludging Method (Shallow TW Schemes) Percussion Drilling (Deep Tubewell Schemes)
Platform Size	2.0 m diameter
Truck Transportation	200 Km
Roadhead to site	2 Km
Site for Stone	40 Km Truck transport and 200 m Porterage
Site for Sand	20 Km truck transport and 200 m porterage
Weight of materials	
Convenient	500 Kg (STW) 700 Kg (DTW) 2500 kg (DW)
Inconvenient	50 Kg (STW) 300 kg (DTW) 100 kg (DW)

Table 46: Assumptions for Typical Spring Protection Scheme in Hill
(for cost estimate of spring protection Table 51)

Present Population	300 (50HH)
Future Population	390 (20 years)
Growth Factor	1.3
Design Period	20 years
Demand	45 lpcd
No. of Springs	7 Nos per scheme
Safe Yield	0.02 lps (Minimum per spring)
Taps	1 taps per spring
Pipe length	Upto 10 m
Population	56 person (design) per spring
	(7 l
Truck Transportation	200 Km
Roadhead to site	13 Km
Site for Stone	200 m
Site for Sand	2 Km
Weight of materials	
Convenient	400 Kg
Inconvenient	100 Kg

Table 47: Cost Estimate of Typical Gravity Scheme
(for Water Supply and Sanitation Cost Table 7)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE NRs.	AMOUNT NRs
1	Source Development				19115.05
a	Spring Intake or Spring fed stream	No.	1.00	19115.05	19115.05
2	Conveyance				211891 25
a	Reservoir 8 m3 masonry or 2* 5 m3 ferrocement	No.	1.00	44734.16	44734.16
b	Collection Chamber or Interruption/BPT/ Distribution chamber	No.	2.00	9106.33	18212.66
c	Valve chamber/Washout	No	2.00	4866 58	9733 16
d	Pipe Line	Km	2562.50		139211 27
3	Service points				42216 44
	Tapstands	No.	7 00	6030.92	42216 44
	Sub Total (A)				273222.74
B	Tools and Equipments @3%				8196 68
C	Transportation				
1	By Truck (4 ton)	Km	200 00	12.00	2400.00
					6900.00
2	By Porters (4 ton, 13km)				
	Convenient materials(1t)	md	40.00	60.00	2400 00
	Inconvenient materials(3t)	md	75.00	60 00	4500.00
	Sub Total (C)				9300.00
	Sub-Total (A+B+C)				290719.42
D	Design, Supervision Overheads @20%				58143 88
	Total				348863.31
	Per Capita Cost (Present Pop 300)			1157.00	
	Per Capita Cost (Design Pop. 390)			894 52	~890
	Scheme Cost (7 taps)				347100

(derived from Table 44 for Typical gravity scheme assumption;
Table 53-58 for system components cost & Table 71-72 for unit rates)

Table 48 Cost Estimate of Typical Shallow Tube Well
(for Water Supply and Sanitation Cost Table 7)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE	AMOUNT
A	CONSTRUCTION MATERIALS				
1	Cement	bags	7 5	239	1792 5
2	Stones	m3	1 56	462	720.72
3	Sand	m3	1.8	247	444.6
4	Gravel	m3	0 66	414	273 24
5	Ready made gride	No	1	250	250
6	90mm 2.5 kg HDP	m	3	85.1	255.3
	Sub Total (A)				3736.36
B	LABOR				
1	Labor Skilled	md	5.27	85	447.95
2	Labor Unskilled	md	14 08	45	633 6
	Sub Total (B)				1081 55
C	FITTINGS				5622
1	40 mm Pvc sand trap	m	1	88	88
2	40 mm Pvc ribbed screen	m	2	132	264
3	40 mm Pvc pipe	m	34	68 07	2314.38
4	40 mm Pvc m/f adoptor	pc	1	33	33
5	Taflon Tape (Large)	roll	1	66 14	66.14
6	40 mm G.I pipe (med)	m	3	185.66	556 98
7	Handpump	pc	1	2299 5	2299.5
9	Sludging	m	40	27.57	1102.8
	Skilled Labour	md	2.75	85	233.75
	Unskilled Labour	md	19 25	45	866 25
10	Sludging for failure (12.5%)	m	5	27 57	137.85
	Sub Total (C)				6862.65
	TOTAL				11680.56

(from Table 45 for typical well scheme assumption, Table 67 for quantity estimate of sludging, Table 71-72 for unit rates)

Table 49: Cost Estimate of Typical Shallow Tube Well (continued .)
(for Water Supply and Sanitation Cost Table 7)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE	AMOUNT
D	Tools and Equipments @8%				934.44
E	Transportation				
1	By Truck (4 ton)	Km	200 00	1 65	330 00
					100 38
2	By Porters (600 kg, 1.5 km)				
	Convenient materials(500Kg)	md	1.44	60 00	86.54
	Inconvenient materials(50kg)	md	0 23	60 00	13 85
	Sub Total (E)				430.38
	Sub-Total (C+D+E)				13045.39
F	Design, Supervision Overheads @20%				2609.08
	Total				15654.47
	(Present Pop 75)			204	
	Per Capita Cost (Design Pop 128)			122 78	~120
	Wells Cost				15300
	Scheme Cost (8 wells)				122400

(from Table 45 for typical well scheme assumption; Table 67 for quantity estimate of sludging, Table 71-72 for unit rates)

Table 49· Cost Estimate of Typical Deep Tubewell
(for Water Supply and Sanitation Cost Table 7)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE	AMOUNT
A.	Drilling and Installation				
	Mobilization and demobilization rig machine equipment personnels etc.		1	L.s	5000
	Preparation of site, errection of equipment and dismantling after completion of the job		1	L s	3750
	Drilling works 8 1/2" dia borehole	m	35	1680	58800
	Lithological logging, sampling and electrical reactivity logging of bore hole		1	L s	1750
	Installation of casing pipe 4" dia into bore hole (logging)	m	35	260	9100
	Gravel packing (well graded gravel backside of casing pipe		1	L.s	2000
	Sanitary Sealing of Tubewell with Cement grounting		1	L.s	1000
	Development of TW of air compresso		1	L.s	12000
	Sub-Total (A)				93400
B.	Pipes and Fittings				
	100 mm dia. 5.4 mm thick plain and MS pipe for casing	m	29	674.56	19562.24
	100 (4") mm dia 5.4 mm thich slotted pipe (1.6 mm*7.5 saw)	m	[illegible]	933	5598
	2 1/2" G.I. Rinset pipe	m	20	330 5	6610
	India Mark III VOLM pump head complete set	No	1	7841.25	7841.25
	Sub-Total (B)				39611 49

(from Table 45 for typical well scheme assumption; Table 68 for quantity estimate of Platform; Table 71-72 for unit rates)

Table 50: Cost Estimate of Typical Deep Tubewell (continued...)
(for Water Supply and Sanitation Cost Table 7)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE	AMOUNT
C.	Platform				
a	CONSTRUCTION MATERIALS				
1	Sand	m3	1.917	247	473 499
2	Aggregate	m3	0.687	414	284 418
3	Boulder Stone	m3	1 694	462	782.628
4	Cement	Bags	8	239	1912
5	Ready Made gride	Nos.	1	250	250
6	90 mm 2.5 kg HDP Drainage pipe	m	3	85.1	255 3
b	LABOUR				
7	Skilled Labour	Nos	6	85	510
8	Unskilled Labor	Nos.	16	45	720
	Sub Total (C)				3957 845
	Sub-Total (A+B+C)				136969.33
D	Tools and Equipments @.1%				1369.69
E	Transportation				
1	By Truck (4 ton)	Km	200 00	3 00	600.00
					272.31
2	By Porters (1000 kg; 2 km)				
	Convenient materials(700Kg)	md	2.69	60 00	161 54
	Inconvenient materials(300kg)	md	1.85	60.00	110 77
	Sub Total (E)				872.31
	Sub-Total (A+B+C+D+E)				139211 34
F	Design, Supervision Overheads @10%				13921 13
	Total				153132.47
	Per Capita Cost (Design Pop. 204)			750.65	750
	Wells Cost				153000
	Scheme Cost (5 wells)				765000

(from Table 45 for typical well scheme assumption, Table 68 for quantity estimate of Platform; Table 71-72 for unit rates)

Table 50: Cost Estimate of Typical Dugwell

(for Water Supply and Sanitation Cost Table 7)

(1993 price)

	DESCRIPTION OF ITEMS	Dept (m)	Mason	Labour	AMOUNT
1	Excavation including ring installation				
1	0 - 5 m	5	8 5	34	2252 5
2	5 - 10 m	5	12 5	50	5312 5
3	10 - 15 m	5	20	80	5300
4	15 - 20 m	5	33 5	134	8877.5
			74.5	298	19742.5
	Av rate per m excavation = Rs. 987	Rs.	6332 5	13410	
2	Ring Casting (1 2·4) 1.2 m & (75 mm				
	Labor	md	0.71	3.57	221
	Cement	bag	3 51	239	838.89
	Rebar	kg	11.42	29 25	334.28
					1394.17
	For 20.3 m	Rs.			28301 651

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE	AMOUNT
3	Slab Castings 1.7 m &, 0.875mm thick				
	Skilled labor	md	0.3	85	25.5
	Unskilled labor	md	1.33	45	59 85
	Cement	bag	1.21	239	289.19
	Sand	m3	0 082	247	20 254
	Aggregates	m3	0.164	414	67 896
	Rebar	kg	27	29 25	789 75
			30 086	1059 25	1252 44
4	Installation				
	Used mobil	lit	54	20	1080
	Pipe clamp	no.	20	40	800
	Stepping Ms rod 10 mm dia.	kg	44	29 5	1298
	India Mark III VOLM and pipes & fittings				27000
					30178

(from Table 45 for typical well scheme assumption; Table 71-72 for unit rates)

Table 50 Cost Estimate of Typical Dugwell (continued .)

(1995 price)

	DESCRIPTION OF ITEMS	Dept (m)	Mason	Labour	AMOUNT
5	Platform				
	Skilled labor	md	0 85	85	72.25
	Unskilled labor	md	3 99	45	179 55
	Cement	bags	4	239	956
	Sand	m3	0.25	247	61 75
	Aggregates	m3	0 5	414	207
			9.59	1030	1476 55
	Total				80951.141
D	Tools and Equipments @.15%				1214.27
E	Transportation				
1	By Truck (2 6 ton)	Km	200.00	7 80	1560.00
					623 08
2	By Porters (2600 kg; 2 km)				
	Convenient materials(2500Kg)	md	9 62	60.00	576 92
	Inconvenient materials(100kg)	md	0 77	60.00	46.15
	Sub Total (E)				2183 08
	Sub-Total (A+B+C+D+E)				84348.49
F	Design, Supervision				
	Overheads @20%				16869.70
	Total				101218.18
	(Present Pop. 120)				
	Per Capita Cost (Design Pop 204)			496.17	~500
	Wells Cost				102000
	Scheme Cost (5 wells)				510000

(from Table 45 for typical well scheme assumption, Table 71-72 for unit rates)

Table 51: Cost Estimate of Typical Spring Protection
(for Water Supply and Sanitation Cost Table 7)

(1993 price)

DESCRIPTION OF ITEMS		UNIT	UNIT QTY	RATE	AMOUNT
1	Source Development				
	Spring Intake	No	1.00	8425.24	8425.24
2	Service points				
	Tapstands	No.	1.00	6030.92	6030.92
	Sub Total (A)				14456.16
B	Tools and Equipments @5%				722.81
C	Transportation				
1	By Truck (4 ton)	Km	200.00	1.50	300.00
2	By Porters (500 Kg.1 ton; 13km)				840.00
	Convenient materials(400kg)	md	10.00	60.00	600.00
	Inconvenient materials(100Kg)	md	4.00	60.00	240.00
	Sub Total (C)				1140.00
	Sub-Total (A+B+C)				16318.97
D	Design, Supervision Overheads @20%				3263.79
	Total				19582.76
	Per Capita Cost (Present Pop.43)		455.00		
	(Design Pop. 56)		351.58		350
	Spring Protection Cost				19500
	Scheme Cost (7 springs)				136500

(from Table 46 for Typical spring protection scheme assumption; Table 59 for for cost estimate of spring protection intake; Table 56 for cost estimate of Public standpost and Table 1-72 for unit rates)

Table 52: Estimated Capital cost breakdowns of Typical Schemes
(for Water Supply and Sanitation Cost Table 7) (1993 price)

	Materials	Tools & Equip.	Transp	Skilled Labour	Local Materials	Unskilled Labour	Porterin	Des sup Overheads	Total Cost	
Typical Gravity Scheme										
	164812.15	8196.68	2400.00	5808 97	47225 74	55375 88	6900 00	58143 88	348863 31	Rs.
	47.24%	2 35%	0 69%	1.67%	13 54%	15 87%	1 98%	16 67%	100 00%	%
	50.00%			2.00%		31 00%		17 00%	100 00%	%
Typical Shallow Tube Well										
	7919 8	934 444	330	819 55	1438.56	1499 35	100.384	2609 077	15651.667	Rs
	50 60%	5.97%	2 11%	5 24%	9.19%	9 58%	0.64%	16.67%	100 00%	%
	58.00%			6 00%		19 00%		17 00%	100.00%	%
Typical Deep Tubewell										
	40185 59	94769 6	600	85	1123	720	272.307	13921 13	151676 72	Rs
	26.49%	62.48%	0.40%	0 06%	0.74%	0.47%	0.18%	9.18%	100 00%	%
	89.00%			0.50%		1.50%		9.00%	100 00%	%
Typical Dugwell										
	56028 291	1214.26	1560	7655.35	356.9	16910.59	623 076	16869 69	101218.18	Rs
	55 35%	1 20%	1.54%	7 56%	0 35%	16.71%	0 62%	16.67%	100.00%	%
	58 00%			8.00%		17.00%		17 00%	100.00%	%
Typical Spring Protection										
	7809 828	722 807	300	738 2	4678 73	1229.4	840	3263 793	19582.759	Rs
	39 88%	3.69%	1.53%	3 77%	23 89%	6.28%	4 29%	16 67%	100.00%	%
	45.00%			4 00%		34 00%		17 00%	100 00%	%

(derived from cost estimates Table 47-52)

Table 53 Estimated Cost of Spring Intake
(for cost estimate of typical gravity schemes Table 47)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE NR	AMOUNT NR
A	CONSTRUCTION MATERIALS				
1	Cement	bags	12.47	239.00	2980.57
2	Sand	m3	2.14	1170.00	2506.14
3	Stone	m3	5.08	236.00	1199.35
4	Gravel	m3	1.27	997.00	1269.18
5	Wood	m3	0.29	4661.58	1356.52
	Sub Total (A)				9311.76
B	LABOR				
1	Skilled	md	8.39	80.00	671.52
2	Unskilled	md	33.66	45.00	1514.88
	Sub Total (B)				2186.40
C	FITTINGS				
1	HDP Endcap 1 1/2"	pc	2.00	27.80	55.60
2	HDP Strainer 1 1/2"	pc	2.00	450.00	900.00
3	HDP Tee 1 1/2"	pc	1.00	50.71	50.71
4	HDP Reducer 1 1/2"	pc	3.00	16.29	48.87
5	HDP pipe 63 mm	m	5.00	85.10	425.50
6	Flange set/Brass Union	pc	3.00	302.03	906.09
7	G.I. pipe 1 1/2"	m	10.00	185.66	1856.60
8	G.I. Union 1 1/2"	pc	3.00	121.33	363.99
9	G.I. Nipple 1 1/2"	pc	3.00	44.27	132.81
10	Gate valve 1 1/2"	pc	3.00	862.40	2587.20
11	G.I Tee 1 1/2"	pc	2.00	82.39	164.78
12	G.I. Elbow 1 1/2"	pc	2.00	62.37	124.74
	Sub Total (C)				7616.89
	TOTAL				19115.05

(derived from Table 60 for quantities Table 71-72 for unit rates)

Table 54 Cost Estimate of Valve Chamber
(for Cost estimate of typical gravity schemes Table 47)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE NRs	AMOUNT NRs
A	CONSTRUCTION MATERIALS				
1	Cement	bags	4.50	239.00	1075.50
2	Sand	m3	0.86	1170.00	1006.20
3	Stone	m3	1.79	236.00	422.44
4	Gravel	m3	0.17	997.00	169.49
	Sub Total (A)				2673.63
B	LABOR				
1	Skilled	md	2.64	85.00	224.40
2	Unskilled	md	9.19	45.00	413.55
	Sub Total (B)				637.95
C	FITTINGS				
1	G.I. HDP flange set 1 1/2"	pc	2.00	302.03	604.06
2	G.I Nipple 1 1/2"	pc	2.00	44.27	88.54
3	G.I. Valve 1 1/2"	pc	1.00	862.40	862.40
	Sub Total (C)				1555.00
	TOTAL (NRs)				4866.58

(derived from Table 61 for quantity estimate, Table 71-72 for unit rates)

Table 55 Cost Estimate of Interruption/BPT/Distribution Chamber
Collection Chamber
(for Cost estimate of typical gravity schemes Table 47)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE NRs.	AMOUNT NRs.
A	CONSTRUCTION MATERIALS				
1	Cement	bags	9 89	239 00	2363 71
2	Reinforcement bar	Kg.	0.48	29 25	14 04
3	Binding wire	Kg.	2 80	36 00	100 80
4	Sand	m3	0 86	1170 00	1006.20
5	Stone	m3	1 79	236 00	422.44
6	Gravel	m3	0.17	997 00	169 49
	Sub Total (A)				4076.63
B	LABOR				
1	Skilled	md	5 51	45 00	247 95
2	Unskilled	md	18.11	85 00	1539.35
	Sub Total (B)				1787 30
C	FITTINGS				
1	G I.Elbow 1"	pc	3.00	28.71	86.13
2	G.I. Pipe 1"	m	6.00	123 50	741 00
3	Brass Union	pc	4 00	162.80	651 20
4	End cap	pc	1.00	14 90	14 90
5	HDP Pipe	m	5 00	85 10	425.50
6	HDP Strainer	pc	1.00	100.00	100 00
7	G.I. Tee	pc	2 00	40.70	81 40
8	Float valve/ Globe valve	pc	2.00	450 00	900 00
9	G I Nipple	pc	4.00	27 83	111.32
10	G.I. Union	pc	2 00	65.45	130 90
	Sub Total (C)				3242 35
	TOTAL (NRs)				9106.33

derived from Table 62 for quantity estimate, Table 71-72 for unit rates)

Table 56 Cost Estimate of Public Stand Post
(for cost estimate of typical gravity scheme Table 47)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE NRs	AMOUNT NRs
A	CONSTRUCTION MATERIALS				
1	Cement	bags	5.67	239 00	1355.13
2	Sand	m3	1.33	1170 00	1556 10
3	Stone	m3	2 02	236 00	476 72
4	Gravel	m3	0 39	997 00	388 83
	Sub Total (A)				3776 78
B	LABOR				
1	Labor Skilled	md	3 80	85 00	323 00
2	Labor Unskilled	md	13.13	45 00	590 85
	Sub Total (B)				913 85
C	FITTINGS				
1	HDPE pipe 63 mm	m	5 00	77 38	386 90
2	G.I pipe 1/2"	m	4 00	65 00	260 00
3	G I. Elbow 1/2"	pc	2.00	11.88	23 76
4	G.I. Socket 1/2"	pc	1.00	9 79	9 79
5	Brass Tap 1/2"	pc	1 00	198.00	198 00
6	20 mm Brass Union	pc	1 00	59.40	59 40
7	G I Nipple 1/2"	pc	1.00	11 94	11 94
8	2 1/2" G I pipe	m	1 00	330 50	330.50
9	Globe valve 1/2"	pc	1.00	60 00	60 00
	Sub Total (C)				1340.29
	TOTAL				6030.92

(derived from Table 63 for quanity estimate, Table 71-72 for unit rates)

Table 57. Cost Estimate of Pipe Line its Laying and Joining (for cost estimate of typical gravity scheme Table 47)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE	AMOUNT
A	CONSTRUCTION MATERIALS				
1	40 mm & HDPE pipes	m	2050 00	35 00	71750 00
2	32 mm & HDPE pipe	m	512 50	22 63	11597.88
3	Kerosene	lt	1.00	9 75	9 75
	Sub Total (A)				83357 63
B	LABOR				
1	Labor Skilled	md	3.75	85 00	318 75
2	Labor Unskilled	md	956 25	45 00	43031.25
	Sub Total (A)				43350.00
C	Fittings @ 15% of pipe cost				12503.64
	Total				139211 27

(derived from Table 64 for quantity estimate, Table 71-72 for unit rates)

Table 58: Cost Estimate of Reservoir Tank
(for cost estimate of typical gravity scheme Table 47)

(1993 price)

	DESCRIPTION OF ITEMS	Unit	Quantity	Rate NRs	Amount NRs
A	CONSTRUCTION MATERIALS				
1	Cement	bags	48 45	239 00	11579 55
2	Rebar	kg.	48.20	29 25	1409 85
5	Binding wire	kg	4.82	36.00	173 52
7	Polyethene sheet 90cm	m	6 72	40 00	268 80
	Sub Total (A)				13431.72
B	LOCAL MATERIALS				
2	Stones	m3	13 43	385.20	5173.24
3	Aggregate 5 - 25 mm	m3	1 77	1230 00	2177 10
4	Sand	m3	5.32	1628 00	8660.96
	Sub Total (A)				16011.30
C	LABOR				
1	Labor Skilled	md	26.00	85 00	2210.00
2	Labor Unskilled	md	75.00	45 00	3375 00
	Sub Total (B)				5585.00
D	FITTINGS				
1	G.I. Strainer 1 1/2"	pc	1.00	100 00	100.00
2	G.I. Elbow 1 1/2"	pc	8.00	62.37	498.96
3	G.I Nipple 1 1/2"	pc	6 00	44.27	265.62
5	G.I. Equal Tee 1 1/2"	pc	2 00	82 39	164 78
7	G.I. Union 1 1/2"	pc	3.00	121.33	363.99
8	Flange Set 1 1/2"	pc	3.00	302.03	906 09
9	G.I. End Cap 1 1/2"	pc	2.00	27 83	55.66
13	G.I. Pipe 1 1/2"	m	10.00	185.66	1856 60
15	Gate Valve 1 1/2"	pc	3.00	862.40	2587.20
16	HDPE Pipe 63mm (Drainage)	m	10 00	85.10	851 00
	Sub Total (C)				7649 90
	TOTAL				42677.92

(derived from Table 65 for quantity estimate; Table 71-72 for unit rates)

Table 59. Cost Estimate of Spring Protection Intake
(for cost estimate of typical spring protection Table 51)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	UNIT QTY	RATE NRs.	AMOUNT NRs
A	CONSTRUCTION MATERIALS				
1	Cement	bags	9.64	239 00	2304.44
2	Sand	m3	1.25	1170 00	1456.65
3	Stone	m3	2 42	236 00	571.12
4	Gravel	m3	0 23	997.00	229 31
	Sub Total (A)				4561 52
B	LABOR				
1	Skilled	md	5 19	80 00	415.20
2	Unskilled	md	14 19	45 00	638.55
	Sub Total (B)				1053.75
C	FITTINGS				
1	HDP Endcap 1 1/2"	pc	1.00	27.80	27.80
2	HDP Strainer 1 1/2"	pc	1.00	450.00	450.00
4	HDP Reducer 1 1/2"	pc	1.00	16 29	16.29
5	HDP pipe 63 mm	m	5.00	85.10	425.50
6	Flange set/Brass Union	pc	1 00	302.03	302.03
7	G I. pipe 1 1/2"	pc	2.00	185 66	371 32
8	G I. Union 1 1/2"	pc	1.00	121 33	121.33
9	G I. Nipple 1 1/2"	pc	2.00	44 27	88.54
10	Gate valve 1 1/2"	pc	1.00	862 40	862 40
11	G I. Tee 1 1/2"	pc	1.00	82.39	82.39
12	G I. Elbow 1 1/2"	pc	1 00	62.37	62.37
	Sub Total (C)				2809 97
	TOTAL				8425.24

(from Table 66 for quantity estimate and Table 71-72 for unit rates)

Table 60 Quantity Estimate for Spring Intake
(for cost estimate of spring intake Table 53)

S.N	Description	Quantity	Unit	Cement Bags	Sand (m3)	Stone (m3)	Gravel (m3)	Wood (m3)	Skilled Labor	Unskilled Labor	Remarks
1	Site Cleareance										
2	Earthwork in Excavation	4.64	m3							7.84	
3	Back filling	2.50	m3							0.63	
4	Dry Stone Soling With Sand	0.28	m3		0 20	0 31			0.28	0.98	
5	Dry Stone Masonry	0 85	m3			0.94			0 85	1 70	Binding wire 0 17 kg
6	Stone Masonry in (1:4) C/S Mortar	0.97	m3	3.08	0.44	1.07			1 46	4.07	
7	Stone Masonry in (1 6) C/S Mortar	2.52	m3	5 34	1 18	2 77			3 78	10 58	
8	Cement Concrete (1 2 4) in RCC	0.46	m3	2 94	0 20		0 39		0 09	3 22	
9	PCC (1 3·6)	0.25	m3	1.10	0.12		0.22		0 25	1 25	
10	Steel Work in RCC	17 05	kg						0 14	0.20	
11	Centering & Shuttering Work for RCC	5 54	m2					0 29	0.95	1 39	
12	Gravel Packing	0 60	m3				0.66			1.80	
15	600 mm Circular Metal Manhole Cover	1 00	no								
	Total			12.46	2 14	5 09	1.27	0 29	8.40	33 66	

(derived from drawing No 1 Annex 28 & Table 70 for norms)

Table 61. Quantity Estimate for Valve Chamber
(for cost estimate of valve chamber Table 55)

S.N	Description	Quantity	Unit	Cement Bags	Sand (m3)	Stone (m3)	Gravel (m3)	Wood (m3)	Skilled Labor	Unskilled Labor	Remarks
1	Earthwork in Excavation	1 54	m3							1 23	
2	Dry Stone Soling With Sand	0 16	m3		0 11	0.17			0.16	0 50	Binding wire 0 10 kg
3	Stone Masonry in (1·6) C/S Mortar	1.40	m3	3 22	0.67	1 62			2 10	5 88	
4	Cement Concrete (1:2 4) in RCC	0 20	m3	1.28	0 08		0.17		0.30	1 40	
5	Steel Work in RCC	10.65	kg						0.08	0 12	
	Total			4.50	0.86	1.79	0 17	0 00	2 64	9 19	0 00

(derived from drawing No 3 Annex 28 & Table 70 for norms)

Table 62 Quantity Estimate for Collection Chamber, Break Pressure Chamber, Distribution Chamber
(for cost estimate of interruption, BPT, distribution, collection chamber Table 54)

S.N	Description	Quantity	Unit	Cement Bags	Sand (m3)	Stone (m3)	Gravel (m3)	Wood (m3)	Skilled Labor	Unskilled Labor	Remarks	
1	Site Clearance		L.S									
2	Earthwork in Excavation (hard soil)	3.33	m3							2.66	20 Bamboo (No.)	0.4
3	Dry Stone Soling With Sand	0.55	m3		0.39	0.61			0.55	1.94	20. Binding wire (kg)	0.21
4	Stone Masonry in (1:4) C/S Mortar	1.93	m3	5.79	0.79	2.12			2.89	8.10	20 HDPE Pipe (coil)	0.43
5	Cement Concrete (1:2:4) in PCC	0.20	m3	1.26	0.09		0.17		0.20	0.98		
6	Cement Concrete (1:2:4) in RCC	0.37	m3	2.361	0.16		0.31		0.55	7		
7	Steel Work in RCC	28	kg						0.224	0.34		
8	Formwork for	1.93	m2						0.24	2.30		
9	12.5 mm thick 1:4 cement plaster	4.50	m2	0.49	0.07				0.86	0.855		
	Total			9.89		_.73	0.48	0.00	5.52	23.32		

(derived from drawing No. 4 Annex 28 & Table 70 for norms)

Table 63: Quantity Estimate for Public Stand Post
(for cost estimate of public stand post Table 56)

S.N	Description	Quantity	Unit	Cement Bags	Sand (m3)	Stone (m3)	Gravel (m3)	Wood (m3)	Skilled Labor	Unskilled Labor	Remarks
1	Site Cleareance										
2	Earthwork in Excavation	1.58	m3							2.51	
3	Dry Stone Soling With Sand	0.82	m3		0.57	0.89			0.82	2.87	
4	Stone Masonry in (1:6) C/S Mortar	1.03	m3	2.18	0.48	1.13			1.54	4.32	
5	PCC (1.2.4)	0.46	m3	2.94	0.20		0.39		0.46	2.45	
6	Cement Plaster 20 mm thick (1:4)	5.16	m3	0.55	0.07				0.98	0.98	
7	Cement Pointing (1.3)		m3								
8	Formwork for Ferro-cement		m3								
9	Insalltion of pipe and fittings		m3								
	Total			5.67	1.32	2.02	0.39		3.80	13.13	

(derived from drawing No. 5 Annex 28 & Table 70 for norms)

Table 64: Quantity Estimate for Pipe Laying and Joining
(for cost estimate of pipe line its laying and joining Table 57)

S.N	Description	Quantity	Unit	Cement Bags	Sand (m3)	Stone (m3)	Gravel (m3)	Wood (m3)	Skilled Labor	Unskilled Labor	Remarks
1	E/W excavation in Pipe Line	900 00	m3							700 00	
2	Refilling in Trench Work	900 00	m3							225 00	
3	Pipe Laying and Joining	2500 00	m						3.75	11 25	
	Total								3 75	936 25	

(from Table 70 for Norms, Table 44 for typical gravity scheme assumption)

Table 65: Quantity estimate of reservoir
(for cost estimate of reservoir Table 58)

S N.	Description	Quantity	Unit	Cement Bags	Sand (m3)	Stone (m3)	Gravel (m3)	Wood (m3)	Skilled Labor	Unskilled Labor	Remarks
1	Site Cleareance										
2	Earthwork in Excavation	4.63	m3								
3	Dry Stone Soling With Sand	2.59	m3								
4	Stone Masonry in (1.6) C/S Mortar	9.62	m3								
5	Cement Concrete (1.2 4) in RCC	0.94	m3								
6	PCC (1.3 6)	1.14	m3								
7	Steel Work in RCC	48.20	kg								
8	Cement Plaster 20 mm thick (1 3)	20.94	m3								
9	Cement Punning (1 1)	20 94	m3								
	Total			48 45	5 32	13.43	1.77		26 00	75 00	

(derived from drawing no 6 Annex 28; & Table 70 for Norms)

Table 66. Quantity Estimate for Spring Catchment for Spring Protection
(for cost estimate of spring protection scheme 51)

S.N	Description	Quantity	Unit	Cement Bags	Sand (m3)	Stone (m3)	Gravel (m3)	Wood (m3)	Skilled Labor	Unskilled Labor	Remarks
1	E/W excavation	1 65	m3							1.32	
2	PCC (1:2:4)	0 27	m3	1.73	0.12				0.27	1 35	
3	R R masonary (1 4)	2 20	m3	6 60	0.95	2 42			2.60	9 24	
4	12.5 mm cement plaster (1 4)	12.00	m2	1 30	0.18				2 28	2 28	
	Total			9 62	1.25	2.42	0.00	0 00	5 15	14 19	

(derived from drawing No 7 (Annex 28) , Table 70 for norms)

Table 67 Quantiy Estimate of Sludging Shallow Tubewell borehole
(for cost estimate of typical shallow tubewell Table 48)

Skilled Labor (Rs/day)	85							
Unskilled Labor (Rs/day)	45							
Description	**Depth (m)**	**Mistri**	**Labor**	**Skilled Rs.**	**Unskilled Rs**	**Tools and Plumber**	**Total**	**Rate**
0 - 20 m	20	1.00	7 00	85.00	315 00	2 55	402.55	20 13
20 - 30 m	10	0 75	5.25	63 75	236 25	1 91	301 91	30.19
30 - 40 m	10	1.00	7 00	85 00	315.00	2.55	[illegible] 55	40 26
Sub-Total	40	2.75	19 25	233.75	866 25	7 01	1107 01	27.68
40 - 50 m	10	1 50	10 50	127 50	472 50	3 83	603.83	60 38
50 - 60 m	10	2.00	14.00	170 00	630 00	5 10	805 10	80.51
Total	60	6.25	43.75	531.25	1968.75	15 94	2515.94	41 93
Per m Sludging Rate for 40 m depth NRs. 27 6								

(from Table 70 for norms)

Table 68: Quantiy Estimate of Platform for tubewell
(for cost estimate of tubewell Table 46-49)

S N	Description of Work	Quantity	Unit	Sand m3	Aggregate m3	Stone m3	cement Bags	40 mm MS Bar	Ready made grid	HDP 90 mm 2.5 kg/cm2	Village Labor	Skilled Labor	Unskilled Labor
1	E/W excavation in bolder mixed Soil	1.99	m3	-	-	-	-	-	-	-	-	-	3 16
2	Sand filling	0.352	m3	0 38	-	-	-	-	-	-	-	0 228	-
3	Boulder Soiling	1 203	m3	0.85	-	1.371	-	-	-	-	-	1 [illegible]	[illegible]
4	Dry Stone Monary 1:6	0 3375	m3	0.15	-	0.371	0 71	-	-	-	-	0 506	1 [illegible]
5	P C.C Work (1:2:4)	0.809	m3	0.35	0 687	-	5 17	-	-	-	-	0 809	[illegible] 045
6	Pre Cast Slab (1:2:4)												
7	12 5 mm thick Plaster (1:4)	11.269	m2	0.16	-	-	1.21	-	-	-	-	2 141	2 141
8	Cement Punning (1:1)	11.269	m2		-	-	1.194	-	-	-	-	1 126	1.126
9	Drainage Work	(H.D P)	m	-	-	-	-	-	-	3	-		
10	Ready made Grid		No	-	-	-	-	-	1	-	-		
	Total			1.91	0.687	1.742	8.284	-	1	3	-	6.013	16 129

(derived from drawing No 8 (Annex 28) & Table 70 for norms)

Table 69 cost estimate of Sanitation Latrine

Latrine upto Pan Level Cost in 1991 Prices N.Rs.	Materials	Transportation	Skilled Labor	Unskilled Labor	Total	Cost in 1993 Price
Ordinary Pit with wooden floor	282		50	12	344	443 15
Pit Latrine with concrete slab	170		18	9	197	253 78
Pit Latrine with concrete slab & pan	202		36	59	297	382.60
Ventilated Improved Latrine with concret slab (HDPE pipe for ventilation)	346		18	9	373	480 51
Two-Pit (Direct Pit) Pour Flush Latrine (8 concrete rings, 1 pan slab, 1 plain slab)	736		105	26	867	1,116 89
Two-Pit Pour Flush Latrine (brick ring) 1 pan, 2 plain slab brick conducts	578		59	82	719	926 23

Source: Based on Water Aid Estimate

Superstructures Cost in 1991 Prices N.Rs.	Materials	Transportation	Skilled Labor	Unskilled Labor	Total	Cost in 1993 Price
Brick Masonary	2725	400	265	192	3582	4,614.42
Stone Masonary	2530	378	265	192	3365	4,334.88
Wooden Structure	3178		650	100	[illegible]	5,060 15
Bamboo Structure	325	20	90	12	447	575 84

Source. Based on Water Aid Estimate

Table 70 Norms for quantity/cost estimating

Norms code & Item Description	Unit	Unskill Labour manday	Skilled Labour manday	Material Input: Cement bags	Sand m3	Aggregate m3	Stone m3	Brick No	Other Materials: Material	Unit	Qty.
Earthwork Excavation											
Soft soil	m3	0.700									
Hard soil (gravel mixed)	m3	0.800									
Soft Rock	m3	1.400									
Hard Rock	m3	5 000									
Back Filling Work											
Ordinary soil and Compaction with water	m3	0.500									
Ordinary soil and Compaction without water	m3	0.250									
Sand with compaction	m3	0.700									
Turfing	m2	0.050									
Dry Foundation excavation Upto 2 m											
Soft soil	m3	1.150									
Hard soil (gravel mixed)	m3	1.490									
Soft Rock	m3	2 200									
Hard Rock	m3	25.200									
Under Water Excavation											
Soft soil	m3	2.250									
Hard soil (gravel mixed)	m3	2.500									
Soft Rock	m3	3.330									
Foundation Preparation											
Stone soling	m2	3.500	1 000								
Brick soling on flat	m2	0.050	0.050		0 03			41 00			
Brick soling on edge	m2	0 080	0.080		0 02			75 00			
Rubble stone masonry											
1:4 Cement mortar	m3	4.200	1.500	3.00	0.41		1 10				
1:6 Cement mortar	m3	4.200	1 500	2 30	0 45		1 10				
Mud Mortar	m3	2 250	1 000				1 10				
Dry	m3	2 250	1.000				1 10				

Table 70: Norms for quantity/cost estimating

Norms code & Item Description	Unit	Unskill Labour manday	Skilled Labour manday	Material Input: Cement bags	Sand m3	Aggregate m3	Stone m3	Brick No	Other Materials: Mateiral	Unit	Qty.
PCC Work											
1 2:4 (Grade M15)	m3	5 0.0	1 000	6 40	0 44	0.85					
1 3 6 (Grade M10)	m3	5.000	1.000	4.40	0.46	0 89					
R C C. Work											
1 2:4 (Grade M15)	m3	7.000	1 500	6.40	0 44	0 85	5 95	1 23	7 18		
Reinforcement Bar											
Stretching, cutting, bending, blacing & binding	Kg	0 012	0 008						Binding Wire	Kg	0.01
									MS bar	Kg	1 05
Form Work											
Foundation Footing	m2	0.125	0.125						Planks	m2	1.00
									Batten	m3	0 01
									Nails	Kg	0 06
Vertical surface or wall<4m	m2	0.210	0.144						Planks	m2	1.00
									Batten	m3	0 05
									Nails	Kg	0 10
Slabs	Sq m.	0 250	0.170						Planks	m2	0 05
									Nails	Kg	0 25
Plaster Work											
12 5 mm in 1:4 CM	m2	0 1[illegible]	0.190	0.11	0 01						
12 5 mm in 1:6 CM	m2	0.190	0.190	0.08	0 00						
20 mm in 1:3 CM	m2	0.190	0.190	0.11	0.01						
Cement Pointing											
in Rubble Stone Masonry 1 1	m2	0 100	0.100	0 12	0 00						
in Brick work 1 1	m2	0 100	0.100	0 01	0 00						
Cement Punning	m2	0 10[illegible]	0.100	0 11							

Table 70 Norms for quantity/cost estimating (continued .)

Norms code & Item Description	Unit	Unskill Labour manday	Skilled Labour manday	Material Input: Cement bags	Sand m3	Aggregate m3	Stone m3	Brick No	Other Materials: Mateiral	Unit	Qty.
Gabion Box (Making/placing/filling with collected boulders) Mesh size 10 cm * 10 cm											
Box size 2*1*.5	Box	1.750	0 700						08 Gauge	kg	2.20
									10 Gauge	kg	12.90
									12 Gauge	kg	0 40
									Stone	m3	1.10
Box size 2*1*1	Box	3.000	1.000						08 Gauge	kg	2 60
									10 Gauge	kg	18 90
									12 Gauge	kg	0.50
									Stone	m3	2 20
Box size 3*1* 5	Box	2 500	1.000						08 Gauge	kg	2 70
									10 Gauge	kg	18.70
									12 Gauge	kg	0 50
									Stone	m3	1.65
Box size 3*1*1	Box	4.500	1.400						08 Gauge	kg	3 10
									10 Gauge	kg	26 70
									12 Gauge	kg	0.60
									Stone	m3	3.30
Gabion Mattress (Making/placing/filling with collected boulders) Mesh size 10 cm * 10 cm											
Box size 3*2* 5	No	3 000	1 700						08 Gauge	kg	3.40
									10 Gauge	kg	32.60
									12 Gauge	kg	0 70
									Stone	m3	3.30
Box size 4*2* 5	No	4.000	2.200						08 Gauge	kg	3.90
									10 Gauge	kg	42.30
									12 Gauge	kg	0.70
									Stone	m3	4.40
Box size 4*3* 5	No	6 000	3 000						08 Gauge	kg	4 50
									10 Gauge	kg	60.20
									12 Gauge	kg	0 90
									Stone	m3	6.60
Box size 5*2* 5		5.000	2.700						08 Gauge	kg	4.40
									10 Gauge	kg	52 10
									12 Gauge	kg	1.00
									Stone	m3	5 50

Table 70: Norms for quantity/cost estimating (continued,)

Norms code & Item Description	Unit	Unskill Labour manday	Skilled Labour manday	Material Input: Cement bags	Sand m3	Aggregate m3	Stone m3	Brick No	Other Materials: Material	Unit	Qty
HDP Pipe Laying and Joining											
Outside pipe diameter 16, 20&25mm	1000	3.000	1.000						Kerosene	Ltr	0.24
Outside pipe diameter 32 mm	1000	[illegible]	1.000						Kerosene	Ltr	0.25
Outside pipe diameter 40 & 50 mm	1000	4.500	1.500						Kerosene	Ltr	0.37
Outside pipe diameter 63, 75&90 mm	50 mm	3.000	1.000						Kerosene	Ltr	0.05
Outside pipe diameter 110 & 125 mm	50 mm	4.500	1.500						Kerosene	Ltr	0.50
Outside pipe diameter 140, 160&180	50 mm	6.000	2.000						Kerosene	Ltr	1.00
GI Pipe laying and joining											
Inside diameter of pipe 15 & 20 mm	30 m	2.00	0.500								
Inside diameter of pipe 25 & 32 mm	30 m	3.00	0.500								
Inside diameter of pipe 40 & 50 mm	30 m	4.00	0.750								
Inside diameter of pipe 65 & 80 mm	30 m	5.00	1.250								
Inside diameter of pipe 100 mm	30 m	6.00	1.750								
Inside diameter of pipe 125 mm	30 m	7.00	2.000								
Galvanized Iron (GI) sheet roofing											
Corrugated sheet roofing	m2	0.250	0.20						GI Sheet	m2	1.20
									8 mm dia	No	3.00
									J-Hook	No	2.50
									Washer	No	5.50
Plain sheet roofing	m2	0.300	0.20						GI Sheet	m2	1.20
									8 mm dia	No	As
									J-Hook	No	required
									Washer	No	required
Slate roofing (20cm x 30cm size)	m2	0.500	0.40						Slate	No	50.00
Material collection, shieving:											
Sand	m3	1.430									
Gravel 5 to 70 mm	m3	2.500									
Gravel 5 to 40 mm	m3	4.000									
Gravel 5 to 20 mm	m3	5.880									
Boulder/rubble	m3	1.400									
Making aggregate/stone bolck											
Aggregate making (20 to 40 mm)	m3	15.000									
Aggregate making (10 to 30 mm)	m3	18.000									
Make stone bolck (No dressed)	m3	5.500									
Stone cut & one side dressed (With	m3	8.150									
Stone cut & one side dressed (W/O	m3	9.630									
Stone bolck with one side dressing	m3	20.000									

Table 70: Norms for quantity/cost estimating (continued. .)

Norms code & Item Description	Unit	Unskill Labour manday	Skilled Labour manday	Material Input: Cement bags	Sand m3	Aggregate m3	Stone m3	Brick No	Other Materials: Mateiral	Unit	Qty.
Portering local material:											
(Including loading/unloading)											
Sand	m3	0 400					@ 0.012 in Hill & @ 0 074 in Terai				
Aggreagate, gravel, pebble	m3	0 300					@ 0.013 in HILL & @ 0.08 in Terai				
Boulder	m3	1 000					@ 0.015 in HILL & @ 0.10 in Terai				
Brick (Number)	1000	1 000					@ 0 01[illegible] in HILL & @ 0 0[illegible] in Terai				
Cement	bag	0 017					@ 0.0015 in HILL & @ 0 00124 in Terai				
Portering form RH to site.											
								Note (1 Kosh = 2 miles = 3 22 km)			
Convenient Materials like cement, fittings etc.	md/kg/kosh	0.005							Or as per district rates		
Inconvenient Materials like Pipes, Rebar etc.	md/kg/kosh	0 005							Or as per district rates		
	md/kg/kosh	0.005									
Boring Tubewell by sludging using 40 mm dia GI pipe (tools and plants & Bentomite mud, rope etc @ 5% labor cost)											
0-20 m depth	20 m	7 000	1.600								
20-30 m depth	10 m	5 250	0.750								
30-40 m depth	10 m	7 000	1.000								
40-50 m depth	10 m	10.500	1 500								
50-60 m depth	10 m	14.000	2.000								
Boring Tubewell by hammer method using 40 mm dia. GI Pipe											
0-2.5 m depth	2 5 m	2.000	0 750								
2.5-5.0 m depth	2 5 m	3.000	1.000								
5.0-7 5 m depth	2.5 m	4 000	1 250								
Tubewell Installation Joining and Installation of GI Pipe casing, well screen, sand trap, fittings, Handpump including coarse sand packing around the well screen and PCC for sanitary seal around GI pipe (for one tubewell)	1 TW	2.000	0.500	0.15	0.10	T&P @ 5% of Labour cost					
Tubewell development (Pumping for eigth hours coninuously)	1 TW	2.000									
Compaction of platform site	1 TW	1.000									

Table 71: Unit Price of Labor and Materials for cost estimating (1995 Market Price)

DESCRIPTION OF ITEMS	UNIT	RATE per Unit NRs.	FOREIGN %	TAX %
CONSTRUCTION MATERIALS				
Cement	bags	239 00	40 00%	25 00%
Reinforcement Steel	kg	29 25	61 00%	15 00%
Binding Wire	kg	36 00	61 00%	15 00%
Plain wire 3.5 mm	kg	37 43	61.00%	15 00%
Chicken Wire mesh 90 cm	m2	46.36	61.00%	15 00%
Wood for formwork	m3	5295		
Snowcem	kg	33 00		
LOCAL MATERIALS				
Hills				
Stones	m3	236 00		
Aggregate	m3	997.00		
Sand	m3	1170 00		
Terai				
Stones	m3	462.00		
Aggregate	m3	414 00		
Sand	m3	247 00		
LABOR REQUIREMENT				
Skilled Labor	md	85 00		
Unskilled Labor	md	45 00		
Porters	md	60 00		
HDPE PIPES AND FITTINGS	kg	100 14	63 00%	20 00%
20 mm (10 kg)		13 4[illegible]		
25 mm (10 kg)		20.23		
32 mm (6 kg)		22.64		
32 mm (10 kg)		33.45		
50 mm (4 kg)		37 85		
50 mm (10 kg)		79 71		
63 mm (6 kg)		85 10		
40 mm (4 kg)	m	25 13		
40 mm HDPE pipe (6 kg)	m	35 00		
40 mm (10 kg)	m	51 47		
50 mm (4 kg)	m	37 [illegible]		
50 mm HDPE pipe (6 kg)	m	59 27		
50 mm (10 kg)	m	79.71		
63 mm (6 kg)	m	85 10		
90 mm (2.5 kg)	m	80 00		
HDPE FITTINGS				
HDP strainer 2"	pc	450 00		
HDP Tee 1/2"	pc	6.27		
1"	pc	23.18		
2"	pc	73.23		
1 1/2"	pc	50.71		

Table 71. Unit Price of Labor and Materials for cost estimating (1993 Market Price) continued....

DESCRIPTION OF ITEMS	UNIT	RATE per Unit NRs	FOREIGN %	TAX %
HDP reducer 1 1/2"-1/2"	pc	16 29		
GI PIPES AND FITTINGS			65 00%	15 00%
G.I. Pipe 1/2"	m	65 00		
(Medium) 3/4"	m	83.33		
1"	m	123.50		
1 1/4"	m	159.50		
1 1/2"	m	185 66		
2"	m	258 66		
2 1/2"	m	330.50		
3"	m	426.66		
4"	m	612.50		
GI FITTINGS				
G.I. Elbow 1/2"	pc	11.88		
1"	pc	28.71		
2"	pc	96.14		
1 1/2"	pc	62.37		
G.I. Socket 1/2"	pc	9.79		
1"	pc	19 79		
1 1/2"	pc	41 14		
G.I. Nipple 1/2"	pc	11 94		
1"	pc	27 83		
2"	pc	50.60		
1 1/2"	pc	44 27		
G.I. equal Tee 1/2"	pc	17 05		
1"	pc	40.70		
1 1/2"	pc	82.39		
G.I. Union 1/2"	pc	31 90		
1"	pc	65.45		
2"	pc	181.50		
1 1/2"	pc	121.33		
Brass Union 1/2"	pc	59 40		
Flange Set 1/2"	pc	156.90		
1"	pc	234 67		
2"	pc	406.00		
1 1/2"	pc	302 03		
Cap G.I. 1/2"	pc	6.54		
1"	pc	9 40		
2"	pc	39.93		
1 1/2"	pc	27 83		
G.I. reducer 1 1/2"-1/2"	pc	52.51		
VALVES AND COCKS				
Glove Valve 1/2"	pc	60.00		
Brass Tap (400g) 1/2"	pc	198.00		

Table 71. Unit Price of Materials for cost estimating
(1995 Market Price) continued ..

DESCRIPTION OF ITEMS	UNIT	RATE per Unit NRs.	FOREIGN %	TAX %
Gate Valve 1/2"	pc	214 50		
1"	pc	467 50		
1 1/2"	pc	862 40		
G.I. strainer 1"	pc	60.00		
1 1/2"	pc	100.00		
Check Valve 1"	pc	450.00		
PVC PIPE AND FITTINGS			63.00%	20.0[illegible]
1 1/2"	m	68 07		
48 mm (1 1/2") Pvc				
Ribbed well screen	m	132.00		
48 mm (1 1/2") Sand Trap	m	88 00		
48 mm (1 1/2") M/F threaded				
socket Adaptor	pc	33.00		
Solvent (Cement (125 g)	pc	143 75		
Tatlon Tape	Roll	66 14		
HAND PUMPS			90 00%	5 00%
Local Hand Pump	pc	780 00		
Nepal No. 6 Improved	pc	229[illegible]		
India Mark III	pc	[illegible]		
TARA III	pc	1500.00		
TRUCK TRANSPORTATION			55.00%	10.00%
(including loading/unloading				
per kg per km)	/kg/km	0.003		

Note: Price list is based on market rates; district rates and rates adopted by other agencies based on average of bid rate

Price includes 10% sales tax and represents the price in major cities of Nepal

Table 72: Unit Price of Local Materials (1993 Price)

HILLS

S.No.	DESCRIPTION OF ITEMS	UNIT	QTY	RATE (Rs)	COST (Rs.)
	SAND TRANSPORTATION (M3)				
1	Material Collection, Sieving	md	1.43		
2	Portering	md	24 28		
	(haulage 2.0 Km)				
			25 71	45 00	1156 95
	AGGREGATES				
1	Collection of Stone	md	1 40		
2	Making Aggregate	md	18 00		
3	Portering Gavel	md	2.77		
	(haulage 200 m)				
			22 17	45.00	997 65
	STONE				
1	Collection of Stone	md	1.40		
2	Portering Stone	md	3.85		
	(haulage 200 m)				
			5.25	45.00	236 25

Table 72: Unit Price of Local Materials for cost estimating (1993 Price) continued

TERAI

SAND (m3)

S No	DESCRIPTION OF ITEMS	UNIT	QTY	RATE (Rs.)	COST (Rs.)
1	Material Collection Sieving	md	1.43	45 00	64 35
2	Transportation by Truck	km	20 00	0.0035	
		Kg	1450.00	/KG/KM	101.50
3	Portering	md	1.80	45 00	81 00
					246 85

STONE

S No.	DESCRIPTION OF ITEMS	UNIT	QTY	RATE (Rs.)	COST (Rs.)
1	Material Collection Sieving	md	1 40	45 00	63 00
2	Transportation by Truck	km	40.00	0.0035	224 00
		KG	1600 00		
3	Loading/Unloading				45 00
4	Portering (200 m)	md	2 90	45 00	130.50
			1644.30		462 50

RIVER AGGREGATE

S No.	DESCRIPTION OF ITEMS	UNIT	QTY	RATE (Rs)	COST (Rs)
1	Material Collection Sieving	md	1.40	45 00	63.00
2	Transportation by Truck	km	40.00	0 0035	224 00
		Kg	1600.00		
3	Loading/Unloading				45 00
4	Portering (200 m)	md	1.82	45.00	81 90
					413.90

Table 73: Design Supervision Cost Estimate (Hills Gravity Schemes)
(for design supervision overheads Table 47)

(1993 price)

Technical Assistance	Yr1	Yr2	Yr3	Total	Rate NRs.	Total NRs
Engineer DA (Mandays)	8	10	2	20	600	12000
Engineer TA (No. of visits)	4	6	2	12	500	6000
Overseer DA (Mandays)	26	28	12	66	200	13200
Overseer TA (No. of visits)	5	10	6	21	500	10500
Technician		90	60	150	3000/mont	15000
Total						56700

Table 74 Design and Supervision Cost Estimate (Terai Wells)
(for design supervision overheads Table 48)

(1993 price)

Technical Assistance	Yr1	Yr2	Yr3	Total	Rate NRs	Total NRs
Engineer DA (Mandays)	2			2	600	1200
Engineer TA (No. of visits)	2			2	500	1000
Overseer DA (Mandays)		15	2	17	200	3400
Overseer TA (No. of visits)		3	2	5	500	2500
Technician		150	45	195	3000/mont	19500
Total						27600

Table 75 Tap flow calculation for Typical Gravity Scheme

(Based on Drawing No 10 Annex 28 for service level/ design standard analysis)

S no	Ward No	Cluster Name	Household Nos	Population Per Household	Present Popul. (PP)	If School No of Pupil	Design Period (N)	Growth Rate %	No of Years for Base Year(n)	Base Popul & PP(1+r)^n	Design Popul. & PP(1+r)^(	Per Capit Water Demand (Lpcd)	Total Water Demand (Lpd)	Tap Flow (Lps)	Peak Factor	Peak Flow (Lps)	Adjusted Tap flow	Adjusted Peak Factor	Tap No	Remarks
1	GRAVITY SCHEME		3	6 00	18	0	[illegible]	1 32	0	18	23	45	1035	0 012	3 00	0 [illegible]	0 1[illegible]	8 35		1
2			7	6 00	42	0	20	1.32	0	42	55	45	2475	0 029	3 00	0 086	0 1[illegible]	3 49		2
3			10	6 00	60	0	20	1 32	0	60	78	45	3510	0 041	3 00	0 122	0 1[illegible]	3 69		3
4			4	6 00	24	0	20	1 32	0	24	31	45	1395	0 016	3 00	0 048	0.1[illegible]	6.19		4
5			5	6 00	30	0	20	1 32	0	30	39	45	1755	0.020	3 00	0 061	0 1[illegible]	4 92		5
6			8	6 00	48	0	20	1.32	0	48	[illegible]	45	2790	0 032	3 00	0 097	0 1[illegible]	3 10		6
7			13	6 00	78	0	20	1.32	0	78	101	45	4545	0 053	3 00	0 158	0 [illegible]	2 85		7
			50	6 00	300						389		17505	0 203		0 608	0 [illegible]			

Reservoir Size Calculation

Reservoir size @ 42% of daily demand (M^3)	7.352
Inflow (l/s)	0 220
Inflow to Outflow ratio	1 086
Req Reservoir size for continuous flow (M^3)	7 350

Note · A pipe design model has been developed in spreadsheet to get pipe design of scheme by varrying the service level (for analysis in chapter VII)

Table 76 Hydraulic calculation and Pipe design for Typical gravity scheme
(Based on Drawing No 10 Annex 28 for service level/ design standard analysis)

Branch No (1)	CHAINGE From (2)	CHAINGE To (3)	LENGTH (4) (m)	Q (5) (Lps)	REDUCED LEVEL UP (RL Up) (6) (m)	REDUCED LEVEL DN (RL Dn) (7) (m)	STATIC LEVEL (8) (m)	HGL Up (9) (m)	LEVEL DIFF 10=6-7 (m)	MAX. STATIC HEAD 11=8-7 (m)	TOTAL HEAD AVAIABLE 12=9-7 (m)	PIPE USED O D. mm	PIPE USED Class Kg cm2	PIPE USED I D mm	PIPE USED Type HDPE/ GI	HEAD LOSS (17) m	RESI-DUAL HEAD (18)=12- m	VELO-CITY (19) m/sec	HYDRAULIC GRADIENT LEVEL (20)=9-17 m	REMARKS (21)
1	S	RVT	1000.00	0.220	1000.00	989.00	1000.00	1000.00	11.00	11.00	11.00	40	6	33.70	HDPE	3.44	7.56	0.25	996.56 RVT	
2	RVT	1	100.00	0.800	989.00	970.00	989.00	989.00	19.00	19.00	19.00	40	6	33.70	HDPE	3.88	15.12	0.90	985.12	1
3	1	2	200.00	0.600	970.00	960.00	989.00	985.12	10.00	29.00	25.12	32	6	26.90	HDPE	13.40	11.00	1.06	971.00	2
4	2	BPT	200.00	0.150	960.00	929.00	989.00	971.66	31.00	60.00	42.00	20	6	14.90	HDPE	17.25	25.41	0.86	954.41 BPT	
5	BPT	T-7	400.00	0.150	929.00	900.00	929.00	929.00	29.00	29.00	29.00	25	6	18.90	HDPE	11.18	17.82	0.53	917.82 T-7	
1	1	11	200.00	0.200	970.00	960.00	989.00	985.12	10.00	29.00	25.12	25	6	18.90	HDPE	9.34	15.78	0.71	975.78	11
2	11	T-2	100.00	0.150	960.00	946.00	989.00	975.78	14.00	43.00	29.78	20	6	14.90	HDPE	8.63	21.16	0.86	967.16 T-2	
3	11	T-1	100.00	0.100	960.00	945.00	989.00	975.78	15.00	44.00	30.78	20	6	14.90	HDPE	4.33	26.45	0.57	971.45 T-1	
1	2	22	200.00	0.350	960.00	950.00	989.00	971.66	10.00	39.00	21.66	32	6	26.90	HDPE	4.58	17.08	0.62	967.08	22
2	22	23	200.00	0.250	950.00	945.00	989.00	967.08	5.00	44.00	22.08	32	6	18.90	HDPE	13.65	8.43	0.89	953.43	23
3	23	T-6	200.00	0.150	945.00	940.00	989.00	953.43	5.00	49.00	13.43	25	6	18.90	HDPE	5.59	7.84	0.53	947.84 T-6	
1	2	33	200.00	0.150	960.00	940.00	989.00	971.66	20.00	49.00	31.66	20	6	14.90	HDPE	17.25	14.41	0.86	954.41	33
2	33	T-3	100.00	0.150	940.00	935.00	989.00	954.41	5.00	54.00	19.41	20	6	14.90	HDPE	8.63	10.78	0.86	945.78 T-3	
1	22	T-4	100.00	0.100	950.00	945.00	989.00	967.08	5.00	44.00	22.08	20	6	14.90	HDPE	4.33	17.75	0.57	962.75 T-4	
1	23	T-5	200.00	0.150	945.00	935.00	989.00	953.43	10.00	54.00	18.43	20	6	14.90	HDPE	17.25	1.18	0.86	936.18 T-5	
			3500.00							39.80	24.08									

Note A pipe design model has been developed in spreadsheet to get pipe design of scheme by varrying the service level (for analysis in chapter VII)

For the head loss calculation Darcy Weisbach Formula has been used The formula used are given below

$$HL = \frac{fLV^2}{2gD} = \frac{f\,(1.1*L)\,V^2}{2*9.81*(D/1000)}$$

$$V = \frac{Q}{A} = \frac{Q*1000}{0.25*(22/7)*D^2}$$

$$\frac{1}{\sqrt{f}} = -2\log\left(\frac{\frac{K}{3.7}D + 2.51}{R\sqrt{f}}\right)$$

$$R = \frac{VD}{Nu} = \frac{VD*1000}{1.14}$$

Where,

HL = Head Loss in m
f = friction coefficient
L = length in m
V = velocity m/s
g = acceleration due to gravity in m/s2
D = diameter of pipe in mm
Q = discharge in l/s
A = area of pipe in m2

K = roughness coefficient in m
R = renold number
Nu = kinematic viscosity in m2/s

The sheet in Table 75-77 are sample outcome of design of the typical gravity scheme (Layout plan in Drawing No 9 Annex 28)

Table 77: Pipe cost calculation for Typical Gravity Scheme
(Based on Drawing No. 10 Annex 28 for service level/ design standard analysis)

PIPE USED				LENGTH	Rate	Amount	Av Weight	Total Weight
O.D. mm	Class Kg cm2	I.D mm	Type HDPE/ GI	(m)	(Rs./m)	(Rs.)	Kg/m	Kg
63	10	47.80	HDPE	0	127.08	0	1.269	0
63	6	53.30	HDPE	0	85.1	0	0.850	0
63	4	56.30	HDPE	0	58.58	0	0.585	0
50	10	38.00	HDPE	0	79.71	0	0.769	0
50	6	42.20	HDPE	0	59.27	0	0.542	0
50	4	44.70	HDPE	0	37.35	0	0.378	0
40	10	30.30	HDPE	0	51.47	0	0.514	0
40	6	33.70	HDPE	1210	35.00	42350	0.350	423.5
40	4	35.60	HDPE	0	25.13	0	0.251	0
32	10	23.80	HDPE	0	33.45	0	0.334	0
32	6	26.90	HDPE	440	22.64	9961.6	0.226	99.44
25	10	18.90	HDPE	1100	20.23	22253	0.202	222.2
20	10	14.90	HDPE	1100	13.42	14762	0.134	147.4
TOTAL			HDPE	3850		89326.6		892.54
1/2"		15	GI	0	65		1.28	0
3/4"		20	GI	0	83.33	0	1.650	0
1"		25	GI	0	123.25	0	2.540	0
11/4"		32	GI	0	159.5	0	3.270	0
11/2"		40	GI	0	185.66	0	3.770	0
2"		50	GI	0	258.66	0	5.320	0
21/2"		65	GI	0	330.5	0	6.820	0
TOTAL			GI	0		0		0
GRAND TOTAL				3850		89326.6		892.54

Table 78. Household Served and Tap flow rate

Present Household per tap	Present Population per tap	Growth Rate %	Design Period Yrs	Design Population per tap	Per capita demand lpcd	24 hr tap flow	Adjusted tap flow	Peak factor	Remarks
5	30	1 32	20	39	45	0 020	0.10	4.92	high PF
		1.32	15	37	45	0 019	0.10	5.19	high PF
		1	20	37	45	0 019	0 10	5.19	high PF
		1	15	35	45	0 018	0 10	5.49	high PF
		2.52	20	49	45	0 026	0 10	3.92	
		2.52	15	44	45	0 023	0 10	4.36	high PF
10	60	1.32	20	78	45	0 041	0 15	3.69	
		1.32	15	73	45	0 038	0 15	3 95	
		1	20	73	45	0 038	0 15	3 95	
		1	15	70	45	0 037	0 15	4 11	high PF
		2 52	20	99	45	0 052	0.15	2 91	
		2.52	15	87	45	0.045	0 15	3.31	
14	84	1.32	20	109	45	0.057	0.20	3 52	
		1.32	15	102	45	0.053	0 20	3.76	
		1	20	102	45	0 053	0 20	3 76	
		1	15	98	45	0.051	0 15	2 94	
		2 52	20	138	45	0 072	0 20	2 78	
		2.52	15	122	45	0 064	0 20	3 15	
12	71	1.32	20	92	25	0 0267	0 1	3.75	for 25lcd
13	76	1.32	15						demand
13	75	1	20						tap
13	79	1	15						serve >9HH
9	56	2.52	20						
11	63	2.52	15						

Note · The analysis is for growth rate 1 to 2 52%, design period 15–20 years
Acceptable peak factor 3–4

Table 79 Cost comparison for typical gravity schemes on different service level (for chapter VII)

Scheme Name	Size of scheme: HH	Trans Pipe (m)	Dist Pipe (m)	Service Level Option: Taps	Taps per HH	Demand lpcd	Design Option: Growth Rate %	Design Year	Reservoir Size (for inflow to outflow ratio 1) m3	Reservoir Size (for inflow to outflow ratio >1) m3	Pipe Cost ratio 1 Rs	Pipe Cost ratio >1 Rs	Reservoir Cost ratio 1 Rs	Reservoir Cost ratio >1 Rs	Total ratio 1	Total ratio >1	% change in cost: Pipe cost ratio >1	Pipe cost ratio 1	Reservoir cost ratio 1	Reservoir cost ratio >1	Total ratio 1	Total ratio >1	Average
Gravity	50	1000	2500	7	7	45	1 32	20	8		87828	87828	46061	46061	133889	133689							
						25	1 32	20	4	1	71112	83472	32710	19632	103822	103104	4 96	19 03	28 99	57 38	22 46	22 99	22 72
						45	1 32	15	7	5	87828	87828	42677	35948	130505	123776	0 00	0 00	7 35	21 96	2 53	7 55	
						25	1 32	15	4	1	71112	83472	32710	19632	103822	103104	4 96	19 03	28 99	57 38	22.46	22 99	22 72
				7	7	45	2 52	20	10		90606	90606	[illegible]	54947	145552	145552							
						25	2 52	20	6	3	78245	83472	37785	26654	118028	113036	7 57	13 04	27 60	48 05	18 91	23.05	20 9[illegible]
						45	2 52	15	9		90605	90605	50849	50849	141454	141454	0 00	0 00	7 46	7 40	2 52	2 52	
						25	2 52	15	5	2	78245	83472	35948	24116	114193	107588	7 87	13 04	34 56	56 11	21 54	26 08	23 81
				7	7	45	1	20	7	6	87828	87828	42677	39783	130505	127611							
						25	1	20	4	1	71112	83472	32710	19632	103822	103104	4 96	19 03	23 35	50 65	20 45	19 20	19 83
						45	1	15	7	5	86468	86468	42677	35948	129145	122416	1 55	1 55	0 00	9 64	1 04	4 07	
						25	1	15	4	1	71112	83472	32710	19632	103822	103104	4 96	19 03	23 35	50 65	20 45	19 20	19 83
	50	1000	2300	5	10	45	1 32	20	8		85405		46061		131466			2 76					
				5	10	25	1 32	20	4		64895	78491	32710	19632	97605	98123	6 10	24 01	28 99	57 38	[illegible]	[illegible]	[illegible]
	50	1000	2600	8	6	45	1 32	20	8		87350		1		135411			-1 73					
				8	6	25	1 32	20	4		75754	87350	[illegible]	19632	[illegible]	[illegible]	0,00	15 72			19 90	19 52	19 71
	50	1000	2600	8	7 (1 Priv	45	1 32	20	8		95066		46061		141127		2 97	-8 24					
				8	7 (1 Priv	25	1 32	20	4		78646	92242	32710	19632	111356	111874		17 27			21 10	20 73	20 91
	50	1000	2600	8	7 (1 Priv	45	1 32	20	8		93522		46061		139583			-6 48					
				8	7 (1 Priv	25	1 32	20	4		79395	92991	32710	19632	112105	112623	0 57	15 11			19 69	19 31	19 50
	50	1000	2600	11	5	45	1 32	20	8		99298		46061		145359			-13 06					
				11	5	25	1 32	20	8		85702	99298	32710	19632	118412	118930	0 00	13 09			18 54	18 18	18 36

Table 80 Cost and benefit comparision for different service level for a typical gravity scheme
(for chapter VII)

Scheme Name	Size of scheme: HH	Trans Pipe (m)	Dist Pipe (m)	Service Level Option: Taps	Taps per HH	Design Option: Demand lpcd	Growth Rate %	Design Year	Scheme cost: Pipe Cost incl. fittings (ratio 1) Rs	Pipe Excavation Laying & Filling Rs	Tap Cost Rs.	Reservoir Cost Rs	Other cost Rs	Overheads Rs	Total Scheme Cost Rs.	% Change	Benefits: HH to Tap distance m	Time for round trip min	Consumption lpcd	Value of Benefit (Rs), B/C Ratio: Total Rs	Change % Benefits	B/C Ratio	ERR
Gravity	50	1000	2500	7	7	45	1 32	20	101002 20	60690 00	42210 00	46061 00	65270 70	63046 78	378280 68		150	10	32	241632		3 81	47 07
						25	1 32	20	81778 80	60690 00	42210 00	32710 00	64293 46	56336.45	338018 72	10 64			20	184581	23 61	3 19	39 21
						45	1 32	15	101002 20	60690 00	42210 00	42677 00	65169 18	62349 68	374098 05	1.11			32	241632	0 00	3 81	47 07
						25	1 32	15	81778 80	60690 00	42210 00	32710 00	64293.46	56336 45	338018 72	10 64			20	184581	23 61	3 19	39 21
				7	7	45	2.52	20	104195 75	60690 00	42210 00	54947 00	65633 08	65535 17	393211 00				32	241632			
						25	2 52	20	89961 75	60690 00	42210 00	39783 00	64751.74	59483 30	356899.79	9 23			20	184581	23 61		
						45	2 52	15	104195 75	60690 00	42210 00	50849 00	65510 14	64690 98	388145.87	1.29			32	241632	0 00		
						25	2.52	15	89961 75	60690 00	42210 00	35948 00	64636 69	58693 29	352159 73	10 44			20	184581	23 61		
				7	7	45	1	20	101002 20	60690 00	42210 00	42677 00	65169 18	62349 68	374098 05				32	241632			
						25	1	20	81778 80	60690 00	42210 00	32710.00	64293 46	56336 45	338018.72	9 64			20	184581	23 61		
						45	1	15	99438 20	60690 00	42210 00	42677 00	65122 26	62027.49	372164.95	0 52			32	241632	0 00		
						25	1	15	81778 80	60690 00	42210 00	32710 00	64293 46	56336 45	338018 72	9 64			20	184581	23 61		
	50	1000	2300	5	10	45	1 32	20	96215 75	57222 00	30150 00	46061 00	64721 26	59274 00	355644 02	5.98	210	14	32	209786	13 15	3 48	42.88
				5	10	25	1.32	20	74629 25	57222 00	30150 00	32710 00	63613 14	51664 88	309989 27	12 84			20	160254	23 61	2 97	36 35
	50	1000	2600	8	6	45	1 32	20	102752 50	62424 00	48240 00	46061 00	65556 13	65006 73	390040 35	-3 11	125	8 33	32	254928	-5 50	3 92	48 48
				8	6	25	1 32	20	87117 10	62424 00	48240 00	32710 00	64686 53	59035 53	354213.16	9.19			20	194738	23 61	3 24	39 89
	50	1000	2600	8	7 (1 Priv	45	1.32	20	109525 90	62424 00	48240 00	46061.00	65753 33	66360 85	398165.07	-5.26	150	10	32	241632	0 00	3 68	45.47
				8	7 (1 Priv	25	1 32	20	90442 90	62424.00	48240 00	32710 00	64786 31	59720.64	358323 85	10 01			20	184581	23 61	3 07	37 68
	50	1000	2600	8	7 (1 Priv	45	1 32	20	107550 30	62424 00	48240 00	46061.00	65700 06	65995 07	395970 43	-4 68	150	10	32	241632	0 00	3 7	45 68
				8	7 (1 Priv	25	1 32	20	91334 25	62424 00	48240 00	32710 00	64812 15	59898 08	359388 48	9 24			20	184581	23 61	3 06	37 59
	50	1000	2800	11	5	45	1 32	20	114192 70	65892 00	66330 00	46061 00	66546 07	71804 35	430826 13	-13 89	100	6 67	32	268144	-10 97	3.8	47 (
				11	5	25	1 32	20	98557 30	65892 00	66330 00	32710 00	65676 48	65833 16	394998.93	8 32			20	204834	23 61	3 12	38

Table B1 Cost Comparison of Masonry and Ferro-cement Reservoirs

Reservoir Size (m3)	Cost of Reservoir (Rs.) Masonry	Ferro-Cement	% difference in cost of Ferro-Cement Reservoir	Ratio of Masonry to Ferro-cement Reservoir cost
1	19632 15	21840.89	-11.25%	0 90
2	24116.83	30834.44	-27.85%	0.78
3	28554.52	32303.10	-13.13%	0.88
4	32710.30	25939.61	20.70%	1.26
5	35948.62	28790.25	19 91%	1.25
6	39783 25	29422.13	26.04%	1.35
7	42677.92	29911.53	29.91%	1.43
8	46061.37	30497 04	33 79%	1.51
9	50849.93	33392.49	34 33%	1.52
10	54947.45	33925.99	38.26%	1.62
20	97901 49	44030.19	55 03%	2.22

Table 82: Cost Estimate of Masonry Reservoirs
(for cost comparision tables 79-81)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	RATE	1 m3		2 m3		3 m3		4 m3	
				QTY	AMOUNT	QTY	AMOUNT	QTY	AMOUNT	QTY	AMOUNT
A	CONSTRUCTION MATERIALS										
1	Cement	bags	239.00	16.47	3936.33	22.72	5430.08	28.82	6887.98	34.59	8267 01
2	Rebar	kg.	29.25	16.38	479.12	22 39	654.91	28.91	845.62	34.44	1007 37
5	Binding wire	kg	36.00	1.63	58 68	2.24	80.60	2.89	104.08	3.44	123.98
7	Polyethene sheet 90cm	m	40.00	1.54	61.60	2 43	97.20	3.41	136.40	4.20	168.00
	Sub Total (A)				4535.73		6262.79		7974.07		9566.36
B	LOCAL MATERIALS										
2	Stones	m3	385.20	4.69	1806 59	6 40	2465.28	8.02	3089.30	9.65	3717.18
3	Aggregate 5 - 25 mm	m3	1230.00	0 59	725.70	0.81	996.30	1.04	1279.20	1.23	1512.90
4	Sand	m3	1628.00	1.83	2979 24	2 52	4102.56	3.18	5177.04	3.82	6218.96
	Sub Total (A)				5511 53		7564.14		9545.54		11449.04
C	LABOR										
1	Labor Skilled	md	85.00	9 00	765.00	12.00	1020.00	16 00	1360 00	19 00	1615.00
2	Labor Unskilled	md	45.00	26.00	1170.00	36.00	1620.00	45.00	2025.00	54.00	2430.00
	Sub Total (B)				1935.00		2640 00		3385.00		4045.00
D	FITTINGS										
1	G.I. Strainer 1 1/2"	pc	100.00	1.00	100.00	1.00	100.00	1.00	100 00	1.00	100 00
2	G.I. Elbow 1 1/2"	pc	62.37	8.00	498.96	8.00	498.96	8.00	498.96	8.00	498.96
3	G.I. Nipple 1 1/2"	pc	44.27	6.00	265.62	6.00	265 62	6.00	265 62	6.00	265.62
5	G.I. Equal Tee 1 1/2"	pc	82.39	2.00	164.78	2.00	164.78	2.00	164.78	2.00	164.78
7	G.I. Union 1 1/2"	pc	121.33	3.00	363 99	3.00	363.99	3.00	363.99	3.00	363.99
8	Flange Set 1 1/2"	pc	302.03	3.00	906.09	3.00	906.09	3.00	906.09	3.00	906.09
9	G.I. End Cap 1 1/2"	pc	27.83	2.00	55.66	2.00	55 66	2.00	55.66	2.00	55 66
13	G.I. Pipe 1 1/2"	m	185.66	10 00	1856.60	10.00	1856.60	10.00	1856.60	10.00	1856.60
15	Gate Valve 1 1/2"	pc	862.40	3.00	2587 20	3.00	2587.20	3.00	2587 20	3.00	2587.20
16	HDPE Pipe 63mm (Drainage)	m	85.10	10 00	851.00	10.00	851.00	10.00	851.00	10.00	851.00
	Sub Total (C)				7649 90		7649 90		7649.90		7649.90
	TOTAL				19632.15		24116.83		28554.52		32710 30

Consultants Estimate based on design of CARE/Nepal.

Table 82: Cost Estimate of Masonry Reservoirs (continued)
(for cost comparison tables 79-81)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	RATE	5 m3 QTY	5 m3 AMOUNT	6 m3 QTY	6 m3 AMOUNT	7 m3 QTY	7 m3 AMOUNT	8 m3 QTY	8 m3 AMOUNT
A	CONSTRUCTION MATERIALS										
1	Cement	bags	239.00	39.06	9335.34	44.32	10592.48	48.45	11579.55	49.48	11825.72
2	Rebar	kg.	29.25	41.03	1200.13	44.88	1312.74	48.20	1409.85	50.86	1487.66
5	Binding wire	kg	36.00	4.10	147.60	4.49	161.57	4.82	173.52	5.08	182.88
7	Polyethene sheet 90cm	m	40.00	5.32	212.80	6.15	246.00	6.72	268.80	7.31	292.40
	Sub Total (A)				10895.87		12312.79		13431.72		13788.66
B	LOCAL MATERIALS										
2	Stones	m3	385.20	10.71	4125.49	12.30	4737.96	13.43	5173.24	13.53	5211.76
3	Aggregate 5 - 25 mm	m3	1230.00	1.46	1795.80	1.66	2041.80	1.77	2177.10	2.77	3407.10
4	Sand	m3	1628.00	4.27	6951.56	4.85	7895.80	5.32	8660.96	6.32	10288.96
	Sub Total (A)				12872.85		14675.56		16011.30		18907.82
C	LABOR										
1	Labor Skilled	md	85.00	21.00	1785.00	24.00	2040.00	26.00	2210.00	27.00	2295.00
2	Labor Unskilled	md	45.00	61.00	2745.00	69.00	3105.00	75.00	3375.00	76.00	3420.00
	Sub Total (B)				4530.00		5145.00		5585.00		5715.00
D	FITTINGS										
1	G.I. Strainer 1 1/2"	pc	100.00	1.00	100.00	1.00	100.00	1.00	100.00	1.00	100.00
2	G.I. Elbow 1 1/2"	pc	62.37	8.00	498.96	8.00	498.96	8.00	498.96	8.00	498.96
3	G.I. Nipple 1 1/2"	pc	44.27	6.00	265.62	6.00	265.62	6.00	265.62	6.00	265.62
5	G.I. Equal Tee 1 1/2"	pc	82.39	2.00	164.78	2.00	164.78	2.00	164.78	2.00	164.78
7	G.I. Union 1 1/2"	pc	121.33	3.00	363.99	3.00	363.99	3.00	363.99	3.00	363.99
8	Flange Set 1 1/2"	pc	302.03	3.00	906.09	3.00	906.09	3.00	906.09	3.00	906.09
9	G.I. End Cap 1 1/2"	pc	27.83	2.00	55.66	2.00	55.66	2.00	55.66	2.00	55.66
13	G.I. Pipe 1 1/2"	m	185.66	10.00	1856.60	10.00	1856.60	10.00	1856.60	10.00	1856.60
15	Gate Valve 1 1/2"	pc	862.40	3.00	2587.20	3.00	2587.20	3.00	2587.20	3.00	2587.20
16	HDPE Pipe 63mm (Drainage)	m	85.10	10.00	851.00	10.00	851.00	10.00	851.00	10.00	851.00
	Sub Total (C)				7649.90		7649.90		7649.90		7649.90
	TOTAL				35948.62		39783.25		42677.92		46061.37

Consultants Estimate based on design of CARE/Nepal.

Table 82: Cost Estimate of Masonry Reservoirs (Continued..)
(for cost comparison tables 79-81)

(1993 price)

	DESCRIPTION OF ITEMS	UNIT	RATE	9 m3 QTY	9 m3 AMOUNT	10 m3 QTY	10 m3 AMOUNT	20 m3 QTY	20 m3 AMOUNT
A	CONSTRUCTION MATERIALS								
1	Cement	bags	239 00	50 54	12079.06	51.60	12332.40	60.82	14535.98
2	Rebar	kg.	29.25	55.36	1619 28	58.80	1719 90	87.14	2548.85
5	Binding wire	kg	36.00	5.53	199.08	5.80	208.80	8 71	313.70
7	Polyethene sheet 90cm	m	40.00	7.92	316.80	8.31	332.40	14.03	561 20
	Sub Total (A)				14214.22		14593 50		17959.73
B	LOCAL MATERIALS								
2	Stones	m3	385.20	15 49	5966.75	16.76	6455.95	31.23	12029.80
3	Aggregate 5 - 25 mm	m3	1230.00	3.77	4637.10	4.77	5867.10	14.77	18167.10
4	Sand	m3	1628.00	7.32	11916.96	8.25	13431.00	18.32	29824.96
	Sub Total (A)				22520.81		25754.05		60021 86
C	LABOR								
1	Labor Skilled	md	85.00	30.00	2550.00	32.00	2720.00	57.00	4845 00
2	Labor Unskilled	md	45.00	87.00	3915.00	94.00	4230.00	165.00	7425 00
	Sub Total (B)				6465.00		6950.00		12270 00
D	FITTINGS								
1	G.I. Strainer 1 1/2"	pc	100.00	1.00	100.00	1.00	100 00	1.00	100.00
2	G.I. Elbow 1 1/2"	pc	62.37	8.00	498.96	8.00	498.96	8.00	498.96
3	G.I. Nipple 1 1/2"	pc	44.27	6.00	265.62	6.00	265.62	6.00	265 62
5	G.I. Equal Tee 1 1/2"	pc	82.39	2.00	164 78	2.00	164.78	2.00	164.78
7	G.I. Union 1 1/2"	pc	121.33	3.00	363.99	3 00	363.99	3.00	363 99
8	Flange Set 1 1/2"	pc	302.03	3.00	906 09	3.00	906.09	3.00	906.09
9	G.I. End Cap 1 1/2"	pc	27.83	2.00	55 66	2.00	55.66	2.00	55.66
13	G.I. Pipe 1 1/2"	m	185.66	10 00	1856.60	10.00	1856.60	10.00	1856.60
15	Gate Valve 1 1/2"	pc	862.40	3.00	2587.20	3.00	2587.20	3.00	2587 20
16	HDPE Pipe 63mm (Drainage)	m	85.10	10.00	851.00	10.00	851.00	10.00	851 00
	Sub Total (C)				7649 90		7649.90		7649 90
	TOTAL				50849.93		54947.45		97901.49

Consultants Estimate based on design of CARE/Nepal.

Table 83. Cost Estimate of Ferrocement Reservoirs (f[illegible] cost comparison tables 81) ([illegible] prices)

	DESCRIPTION OF ITEMS	UNIT	RATE	1 m3		2 m3		3 m3		4 m3	
				QTY	AMOUNT	QTY	AMOUNT	QTY	AMOUNT	QTY	AMOUNT
A	CONSTRUCTION MATERIALS										
1	Cement	bags	239.00	11 34	2710.50	17.61	4208.79	17.26	4125.14	18 85	4505.15
2	Rebar	kg	29 25	10.74	314 15	10.74	314.15	10.74	314 15	10.74	314.15
3	Plain wire 3.5mm	kg	37 43	16.52	618.34	16.52	618.34	23 98	897 57	23.98	897 57
4	Chiken wire mesh 90cm	m2	46.36	14.32	663.88	14 32	663 88	20 79	963.82	20.79	963 52
5	Binding wire	kg	36.00	1.48	53 28	1.67	60.12	2.28	82 08	2.43	87.48
6	Bamboo	pc	45 00	2.00	90.00	0 00	0 00	0 00	0 00	4.17	187.65
7	Polyethene sheet 90cm	m	40 00	2.54	101 60	2 54	101 60	4.15	166 00	4.15	166 00
8	Cement Paint	kg	33.00	1.40	46.20	2.66	87.78	3.31	109.23	4.30	141.90
9	Wood for formwork	m3	[illegible]5.00	0.06	323.00	0.06	317.70	0.06	317.70	0.06	317.70
10	Nails	Kg	0.75	0.37	0.28	0.41	0 31	0.44	0.33	0.82	0 62
11	HDPE pipe coil	No		2.37		3.31		4.31		5 06	
	Sub Total (A)				4921 22		6372.66		6976.02		7582.04
B	LOCAL MATERIALS										
2	Stones	m3	385 20	3 32	1278 86	3.32	1278.86	1.53	589.36	3.14	1209 53
3	Aggregate 5 - 25 mm	m3	1230.00	0.62	762.60	0.62	762.60	0 80	984.00	0.80	984 00
4	Sand	m3	1623 00	1.47	2393 16	2 53	4118.84	2.09	3402.52	2 18	3549 04
	Sub Total (A)				4434 62		6160.30		4975.88		5742.57
C	LABOR										
1	Labor Skilled	md	85.00	14.35	1219.75	18.02	1531.70	19 47	1654.95	23.59	2005.15
2	Labor Unskilled	md	45.00	204.11	[illegible]5	364.78	16415.10	381.27	17157.15	218 61	9837.45
	Sub Total (B)				10404.70		17946.80		18812.10		11842 60
D	FITTINGS										
1	G.I Elbow 1 1/2"	pc	62.37	7 00	436.59	7.00	436.59	7 00	436.59	7 00	436.59
2	G I. Elbow 1/2"	pc	11.88	1.00	11.88	1 00	11 88	1.00	11.88	1.00	11.88
3	G.I. Nipple 1 1/2"	pc	44.27	5.00	221.35	5 00	221.35	5.00	221.35	5 00	221.35
4	G.I. Nipple 1/2"	pc	11.94	1 00	11.94	1.00	11.94	1 00	11.94	1.00	11.94
5	G.I. Equal Tee 1 1/2"	pc	82.39	1.00	82.39	1.00	82.39	1.00	82 39	1.00	82.39
6	G.I. Equal Tee 1/2"	pc	17.05	1.00	17.05	1.00	17.05	1.00	17 05	1.00	17.05
7	G.I. Union 1 1/2"	pc	121.33	2.00	242.66	2 00	242.66	2.00	242.66	2.00	242.66
8	Flange Set 1 1/2"	pc	302.03	2.00	604.06	2.00	604.06	2.00	604 06	2.00	604.06
9	G.I. End Cap 1 1/2"	pc	27.83	2 00	55.66	2.00	55 66	2.00	55.66	2.00	55.66
10	G.I. Reucer 1 1/2" - 1/2"	pc	52 51	1.00	52.51	1.00	52 51	1.00	52.51	1.00	52.51
11	G.I. Bracket 1 1/2"	pc	41.14	2.00	82.28	2.00	82.28	2 00	82.28	2.00	82.28
12	G.I. Bracket 1/2"	pc	9.79	1.00	9.79	1.00	9 79	1.00	9.79	1.00	9 79
13	G.I. Pipe 1 1/2"	m	185.66	10.25	1903.02	10.25	1903.02	10.25	1903 02	10.25	1903.02
14	G.I. Pipe 1/2"	m	65 00	3.20	208.00	3 20	208 00	3.20	208.00	3.20	208.00
15	Gate Valve 1 1/2"	pc	862.40	2 00	1724.80	2.00	1724.80	2.00	1724.80	2.00	1724.80
16	HDPE Pipe 63mm (Drainage)	m	85.10	10 00	851 00	10.00	851.00	10.00	851.00	10.00	851.00
	Sub Total (C)				6514 98		6514 98		6514.98		6514 98
	TOTAL				21840 89		30834.44		32303.10		25939.61

Consultant's Estimate based on CWSS/DWSS design standard 1993

Table 83· Cost Estimate of Ferrocement Reservoirs (for cost comparision tables 81) Continued... (1993 price)

	DESCRIPTION OF ITEMS	UNIT	RATE	5 m3 QTY	5 m3 AMOUNT	6 m3 QTY	6 m3 AMOUNT	7 m3 QTY	7 m3 AMOUNT	8 m3 QTY	8 m3 AMOUNT
A	CONSTRUCTION MATERIALS										
1	Cement	bags	239.00	23.46	5606.94	24.78	5922 42	25.95	6202.05	27.24	6510 36
2	Rebar	kg	29 25	10.74	314.15	10.74	314.15	10.74	314.15	10.74	314.15
3	Plain wire 3.5mm	kg	37.43	32.37	1211 61	32.37	1211.61	32.37	1211.61	32.37	1211.61
4	Chiken wire mesh 90cm	m2	46.36	28.07	1301.33	28.07	1301.33	28.07	1301.33	28.07	1301 33
5	Binding wire	kg	36.00	3 12	112 32	3.25	117.00	3.41	122 76	3 56	128.16
6	Bamboo	pc	45.00	5.10	229.50	5.62	252.90	6.01	270 45	6.53	293.85
7	Polyethene sheet 90cm	m	40.00	6.15	246.00	6.15	246.00	6.15	246.00	6.15	246.00
8	Cement Paint	kg	33.00	4.30	141.90	5.90	194.70	6.52	215.16	7 33	241.89
9	Wood for formwork	m3	5295 00	0 06	317.70	0.06	317.70	0 06	317 70	0 06	317.70
10	Nails	Kg	0 75	0.85	0.64	0 88	0 66	0.54	0.41	0 57	0.43
11	HDPE pipe coil	No		6.18		6 81		7.28		7 91	
	Sub Total (A)				9482 08		9878.46		10201.60		10565.47
B	LOCAL MATERIALS										
2	Stones	m3	385.20	4.25	1637 10	4 25	1637 10	4.25	1637.10	4 25	1637.10
3	Aggregate 5 - 25 mm	m3	1230.00	1.03	1266.90	1.03	1266.90	1.03	1266.90	1.03	1266.90
4	Sand	m3	1628.00	2.78	4525 84	2.86	4656.08	3.77	6137 56	3.85	6267 80
	Sub Total (A)				7429.84		7560.08		9041 56		9171.80
C	LABOR										
1	Labor Skilled	md	85 00	28.59	2430.15	30.45	2588.25	31 76	2699 60	33 51	2848 35
2	Labor Unskilled	md	45.00	230.29	10363.05	232 01	10440.45	233 23	10495.35	234.85	10568.25
	Sub Total (B)				12793.20		13028.70		13194.95		13416.60
D	FITTINGS										
1	G.I. Elbow 1 1/2"	pc	62.37	7.00	436 59	7.00	436 59	7.00	436 59	7 00	436 59
2	G I. Elbow 1/2"	pc	11.88	1.00	11.88	1 00	11.88	1 00	11.88	1.00	11.88
3	G.I. Nipple 1 1/2"	pc	44.27	5 00	221.35	5.00	221.35	5.00	221.35	5.00	221.35
4	G.I. Nipple 1/2"	pc	11.94	1.00	11.94	1.00	11.94	1.00	11.94	1.00	11.94
5	G.I. Equal Tee 1 1/2"	pc	82.39	1.00	82.39	1.00	82.39	1.00	82.39	1 00	82.39
6	G.I Equal Tee 1/2"	pc	17.05	1.00	17 05	1.00	17.05	1.00	17.05	1 00	17 05
7	G.I. Union 1 1/2"	pc	121.33	2.00	242.66	2.00	242.66	2.00	242.66	2.00	242.66
8	Flange Set 1 1/2"	pc	302.03	2.00	604.06	2.00	604.06	2.00	604.06	2.00	604.06
9	G.I. End Cap 1 1/2"	pc	27.83	2.00	55.66	2.00	55.66	2.00	55 66	2 00	55.66
10	G.I. Reucer 1 1/2" - 1/2"	pc	52.51	1.00	52.51	1.00	52.51	1.00	52.51	1.00	52.51
11	G.I. Bracket 1 1/2"	pc	41.14	2.00	82.28	2.00	82.28	2.00	82.28	2.00	82.28
12	G.I. Bracket 1/2"	pc	9.79	1.00	9.79	1.00	9.79	1 00	9.79	1.00	9.79
13	G.I. Pipe 1 1/2"	m	185.66	10.25	1903.02	10 25	1903.02	10.25	1903.02	10.25	1903.02
14	G.I. Pipe 1/2"	m	65 00	3.20	208.00	3.20	208 00	3.20	208.00	3 20	208.00
15	Gate Valve 1 1/2"	pc	862.40	2.00	1724 80	2.00	1724 80	2.00	1724.80	2 00	1724 80
16	HDPE Pipe 63mm (Drainage)	m	85.10	10.00	851.00	10.00	851.00	10 00	851.00	10.00	851.00
	Sub Total (C)				6514.98		6514.98		6514.98		6514.98
	TOTAL				28790.25		29422.13		29911 53		30497.04

Consultant's Estimate based on CWSS/DWSS design standard 1993

Table B3: Cost Estimate of Ferrocement Reservoirs (for cost comparison tables B1) (1993 prices)

	DESCRIPTION OF ITEMS	UNIT	RATE	9 m3 QTY	9 m3 AMOUNT	10 m3 QTY	10 m3 AMOUNT	30 m3 QTY	30 m3 AMOUNT
A	CONSTRUCTION MATERIALS								
1	Cement	bags	239 00	31 67	7569 13	32.86	7853.54	50 84	12150.76
2	Rebar	kg	29 25	10 74	314 15	10 74	314.15	10.74	314 15
3	Plain wire 3.5mm	kg	37.43	41 72	1561.58	41.72	1561.58	63.24	2367.07
4	Chiken wire mesh 90cm	m2	46 36	36.17	1676 84	36.17	1676.84	54.83	2541.92
5	Binding wire	kg	36.00	4.25	153 00	4.38	157.68	6 52	234 72
6	Bamboo	pc	45.00	7.21	324.45	7.68	345.60	12.09	544.05
7	Polyethene sheet 90cm	m	40.00	8.55	342 00	8.55	342.00	14.52	580 80
8	Cement Paint	kg	33 00	7.74	255.42	8.47	279.51	14.05	463 65
9	Wood for formwork	m3	5295.00	0 06	317.70	0 06	317.70	0.06	317 70
10	Nails	Kg	0.75	0.60	0.45	0.62	0.47	0.80	0.60
11	HDPE pipe coil	No		8 74		9.31		14.66	0.00
	Sub Total (A)				12514 72		12849 06		19515 42
B	LOCAL MATERIALS								
2	Stones	m3	385.20	4.85	1868 22	4 85	1868.22	6.29	2422.91
3	Aggregate 5 - 25 mm	m3	1230 00	1 29	1586 70	1.29	1586.70	1.97	2423.10
4	Sand	m3	1628.00	4.50	7326.00	4.57	7439 96	6 56	10679.68
	Sub Total (A)				10780 92		10894.88		15525.69
C	LABOR								
1	Labor Skilled	md	85.00	38 13	3241.05	39.70	3374.50	60.07	5105.95
2	Labor Unskilled	md	45.00	247 15	11121.75	248.61	11187 45	286.53	12893.85
	Sub Total (B)				14362.80		14561.95		17999 80
D	FITTINGS								
1	G.I. Elbow 1 1/2"	pc	62.37	7.00	436.59	7 00	436.59	7.00	436.59
2	G.I. Elbow 1/2"	pc	11.88	1.00	11 88	1.00	11 88	1 00	11 88
3	G.I. Nipple 1 1/2"	pc	44.27	5.00	221 35	5.00	221 35	5 00	221 35
4	G.I. Nipple 1/2"	pc	11.94	1.00	[illegible].94	1.00	11.94	1 00	11.94
5	G.I. Equal Tee 1 1/2"	pc	82 39	1.00	82.39	1.00	82.39	1.00	82.39
6	G.I. Equal Tee 1/2"	pc	17 05	1.00	17.05	1.00	17.05	1.00	17 05
7	G.I Union 1 1/2"	pc	121.33	2.00	242.66	2.00	242.66	2.00	242.66
8	Flange Set 1 1/2"	pc	302.03	2.00	604.06	2.00	604.06	2.00	604 06
9	G.I. End Cap 1 1/2"	pc	27 83	2 00	55.66	2.00	55 66	2 00	55.66
10	G.I. Reucer 1 1/2" - 1/2"	pc	52.51	1.00	52 51	1.00	52.51	1.00	52 51
11	G.I. Bracket 1 1/2"	pc	41.14	2 00	82.28	2 00	82 28	2.00	82 28
12	G.I. Bracket 1/2"	pc	9 79	1.00	9.79	1.00	9 79	1.00	9 79
13	G.I. Pipe 1 1/2"	m	185.66	10.25	1903.02	10 25	1903 02	10.25	1903.02
14	G.I. Pipe 1/2"	m	65 00	3.20	208.00	3 20	208.00	3.20	208 00
15	Gate Valve 1 1/2"	pc	862.40	2.00	1724 80	2.00	1724.80	2.00	1724 80
16	HDPE Pipe 63mm (Drainage)	m	85 10	10.00	851.00	10 00	851.00	10.00	851 00
	Sub Total (C)				6514.98		6514.98		6514 98
	TOTAL				33392 49		33925.99		44030.19

Consultant's Estimate based on CWSS/DWSS design standard 1993

Table 84: Cost of JAKPAS implemented schemens
(Based on Estimated Cost available so far)

S.No. Scheme Name	Present Population	Present Household	Design Population	No. of Taps	Tranmission Pipe (m)	Distribution Pipe	Total Pipe (m)	Scheme Cost (NRs.)	Per capita Cost (NRs.) [Present Pop.]	Per capita Cost (NRs.) [Design Pop]
1 Ange, Kavre	47	9	64	2	747	172	919	70258	1494.85	1097.78
2 Deswatar, Kavre	142	25	196	6	1237	504	1741	183654	1293 34	937.01
3 Dhakalthok, Kavre	439	74	605	6	240	630	870	222854	507.64	368.35
4 Ramche, Kavre	429	73	592	8	1587	672	2259	400926	934.56	677.24
5 Ranitar, Kavre	161	22	223	3	1020	1265	2285	161366	1002 27	723 61
6 Sanitar, Kavre	102	16	141	3	241	150	391	125421	1229 62	889 51
7 Bhainsetar, Kavre	312	52	430	5	862	805	1667	200879	643.84	467.16
8 Betini, Ramechhap	187	33	236	5	2400	650	3050	226051	1208.83	957 84
9 Dansingtar, Ramechhap	302	45	383	5	500	2100	2600	233734	773.95	610.27
10 Bhattathok, Nuwakot	325	50	477	16	1798	3759	5557	573756	1765.40	1202.84
11 Chuwandanda, Nuwakot	284	50	417	13	696	2619	3315	459911	1619 40	1102.90
12 Kauchini, Taruka	221	40	325	9	999	861	1860	292420	1323.17	899 75
Average	246	41	341	7	1027	1182	2210	262603	1150	828

Table 85. Cost components of JAKPAS implemented schemes
(Based on Estimated Cost available so far)

S.No. Scheme Name	% Materials	% Skilled Labour	% Unskilled Labour	% Overheads	% Community Contribution
1 Ange, Kavre	62.48	3.17	16 18	18.17	16 86
2 Deshwartar, Kavre	47 44	6.61	32 04	13.91	32.61
3 Dhukal Thok, Kavre	52.19	7.28	26 94	13.58	27.67
4 Ramche, Kavre	55.31	5.29	29 19	10.20	29.78
5 Ranitar, Kavre	55.94	5.58	22.82	15 66	23 48
6 Sanitar, Kavre	45.16	6 92	30.01	17.91	30.53
7 Banskota Tole, Kavre	56.50	1.87	26.23	15 39	26.77
8 Bhainsetrar, Kavre	50.10	5.86	30 40	13 64	30.99
9 Tip-Tipey, Kavre	41 51	3.56	42.13	12.80	42.55
10 Betini, Ramechhap	46.71	1.42	41.56	10 31	42.00
11 Danshingtar, Ramechhap	50.05	1.07	38.53	10.35	38.88
12 Bhattathok, Thansing, Nuwakot	43 17	3.00	37 91	15.92	38.36
13 Chuwandanda, Bhadratar, Nuwakot	42 98	3.39	36.67	16.96	37.08
14 Gudthok, Kabilas, Nuwakot	37 50	3.52	41 29	17 68	41.64
15 Kauchhmi, Taruka, Nuwakot	38.55	2 78	39 44	19 23	39 81
16 Thaldanda/Pokharipani	52.03	2.93	34.88	10.16	35.36
Averages	48.60	4.02	32.89	14.49	33.40

Table 86: Averages of agency scheme cost data (without overheads)
(1993 price)

Gravity flow system

S. No.	Agency Name	Population Served	No. of Taps	Population per Tap	Pipe Length Transmission (m)	Pipe Length Distribution (m)	Total Pipe Length (m)	Beneficiaries Cost (In %)	Total Project Cost (NRs.)	Per Capita Cost (NRs.)	Per Capita Cost in 1993 Price
1	UNICEF/DWSS	1141	18	61	4075	2172	6247		472766	573	874
2	FINNIDA/DWSS	2322	22	101	5624	7908	7494	27	2140921	1012	1199
3	HELVETAS/DWSS	979	17	79			8125		797467	816	834
4	CARE/Nepal	246	4	68			1439	24	130037	670	945
5	REDBARNA	212	7	29			3070	41	195994	1057	1587
6	LWS	1330	28	56	2213	7015	7015	36	573385	368	442
7	WATERAID\NEWAH	569						28	296671	601	833
8	NFESC	152						29	85764	416	618
9	SAPPROS	165	4				1166	44	85391	512	573
10	NRCS	482	6	79					183892	418	641

Shallow Tube well

S.No.	Agency	Population served	No. of Wells	Population per well	Depth of well (M)	Beneficieries Cost (In %)	Total Project Cost (NRs.)	Cost Per well (NRs.)	Per Capita Cost (NRs.)	Cost Per Well 1993 Price (NRs.)	Per Capita Cost in 1993 Price (In NRs)
1	FINNIDA\DWSS	8182	87	62	50	12	1245757	14899	156	16368	171
2	CARE/Nepal	355				32	47053		144		204
3	WATERAID\NEWAH	6905	48	157		4	548250	12278	79	17573	111
4	NRCS	18300	150	122		15	1044176	6961	59	7797	66

Deep Tube well

S.No	Agency	Population served	No. of Wells	Population per well	Depth of well (M)	Beneficieries Cost (In %)	Total Project Cost (NRs.)	Cost Per well (NRs.)	Per Capita Cost (NRs.)	Cost Per Well 1993 Price (NRs.)	Per Capita Cost in 1993 Price (In NRs.)
1	FINNIDA\DWSS	6940	33	210	35	0.85	5193546	157380	748	157380	748

Note: All costs are converted into 1993 January prices using GDP deflator. This was 4.1% for FY 1984 to 85 and in the later years 15.9%, 13.3%, 11.0%, 8.1%, 11 5%, 9 8% and from FY 91 to 92 15% and current year's IDA estimate of 12%.

Table 86: Averages of agency data (without overheads) continued..
(1993 price)

Dug well

S.No	Agency	Population served	No. of Wells	Population per well	Depth of well (M)	Beneficiaries Cost (In ..	Total Project Cost (NRs)	Cost Per well (NRs.)	Per Capita Cost (NRs.)	Cost Per Well 1993 Price (NRs.)	Per Capita Cost in 1993 Price (In NRs)
	REDBARNA	150				60	18037		120		179

Spring Protection (point source)

S No.	Agency	Population served	No. of Point Source	Population per source	Beneficiaries Cost (In %)	Total Project Cost (In N Rs.)	Per Point Source Cost (In N Rs.)	Per Capita Cost (In N.Rs)	Cost Per Point Source 1993 (In. NRs.)	Per Capita Cost 1993 (In N Rs.)
1	FINNIDA\DWSS						12699	237	16359	210
2	UNICEF\DWSS						15749	250	15749	250
3	CARE\Nepal		2	271	24	17035	11001	246	14049	320

Source : Different sources

Note: All costs are converted into 1993 January prices using GDP deflator. This was 4.1% for FY 1984 to 85 and in the later years 15.9%, 13.3%, 11.0%, 8.1%, 11.5%, 9.8% and from FY 91 to 92 15% and current year's IDA estimate of 12%

Table 87 Cost Components of different schemes based on agency data

Gravity Flow Schemes

Agency	Material %	Transport %	Skilled Labor %	Unskilled Labor %	Total %
UNICEF\DWSS	60	3	10	24	98
FINNIDA\DWSS	57	13	4	26	100
CARE/Nepal	33	31	3	33	100
LWS	39	23	9	30	100
WATERAID\NEWAH	34	2	5	59	100
NFESC	59	1	8	32	100

Shallow Tubewell Schemes

Agency	Material %	Transport %	Skilled Labor %	Unskilled Labor %	Total %
FINNIDA\DWSS	71	1	13	15	100
LWS	76		5	19	100
NRCS	73		11	15	100

Dugwell Schemes

Agency	Material %	Transport %	Skilled Labor %	Unskilled Labor %	Total %
NRCS	48	2	12	38	100

Source: Different sources

Table [illegible]. Computation of O&M Cost, Gravity Schemes
(Based on MITS - Study 1[illegible])

Capital Cost: NRs 347100
Population Size: 390 (Design Population) (1993 price)

Material Cost (In N.Rs.)	Estimated Capital Value	Maintenance % Factor	Annual Cost	Monthly Cost
Material Cost				
Components:				
Civil Structure (20% of Capital Cost)	69420.00	0.25	173.55	14.46
Pipes (60% of scheme Cost)	208260.00	0.50	[illegible]	86 78
Tapstands/Values (20% of scheme cost)	69420 00	0.75	520.65	43 39
Total Material Cost			1735.50	144.63

	Number	Monthly Rate	Annual Cost	Monthly Cost
Labor Cost				
Type:				
Maintenance Worker	0 50	800.00	4800 00	400 00
Unskilled Labor (20% of MWs Cost)	0 10	800.00	960 00	80 00
Total Labor Cost			5760.00	480.00
Total Cost			7495.50	
Total O&M cost per year	7500			
Total O&M Cost/Months. 552				

Source Consultant's Estimate

Material Cost	0.5% of Capital Cost
Labor Cost	2 2% of Capital Cost
Total	? 7% of Capital Cost

Considering major repairs in every 5 years with 10% of capital cost 3% of capital cost per annum is [illegible]mated to be collected for revolving fund for operation and maintenance i.e. NRs. 10500 per anum per scheme (i.e. NRs 1500 per Tap).

Table 89: Computation of O&M - Gravity Schemes
(Based on Binnie Study - 1990)

Capital Cost NRs 347100
Population Size: 390 (Design Population)

(1993 price)

	Quantity	VMW Hrs./Yr.	LABOUR Hrs./Yr.	Material Cost/Yr. (In N.Rs)
Spring Intake	1	12.00	5.20	80.00
Pipelines	2.5	58.25	105.00	540.00
Pipeline Chambers	4	26 00	22.00	440.00
Reservoirs	1 No.	30.50	-	
Reservoir	10	4.30	0.70	2150 00
Valuable Cost				
Tap Stand	7	326.90		1400.00
Administration (Fixed)		69 00		100.00
Total		526.95	132.90	4710.00
N Rs		4215 00	1066.00	4710.00
Value of O&M tool (Replacement in 5 yr.)	1100			
Total O&M Cost Per Year	11091.00 (3 1% of Capital Cost)			
Total O&M Cost/Month 1863				

Source. Consultant's Estimate.

Material Cost: 1.6% of Capital Cost
Labor Cost. 1.5% of Capital Cost
Total 3.1% of Capital Cost

* Annual Labor Cost is calculated at NRs 6 per and considering 75% efficiency NRs 8 per hr.
 Material Cost is calculated on 1993 price

Considering Major Repairs 3% of Capital Cost per annum is estimated to be collected for Revolving Fund for O&M i.e. NRs 10500 per annum per scheme. Per scheme (i.e. NRs 1500 per Tap)
(from Table 85 for unit quantity & cost Table 45 for typical gravity scheme assumption)

Table 90. Computation of O&M Cost – Spring Protection
(Based on Binnie Study 1990)

Capital Cost. NRs 19500
Population Size. 56 (Design Population)

(1993 price)

Components	Quantity	VMW	LABOUR	Material Cost/Yr (In N Rs)
		Hrs /Yr.		
Spring Intake	1 No	12.60	5.20	80.00
Reservoir	1 Cum	0.43	0.70	
Pipe Lines	0.01 km	0.23	0.42	2.15
Tap Stand	1 No.	46.70		200 00
Total		59.96	6.32	282.15
NRs		479.68	44.80	282.15
Value of O&M Tool (Replacement in 5 yr.) Rs	50			
Total O&M Cost Per Year	806.63			
Total O&M Cost/Month	67			

Source: Consultant's Estimate.

Material Cost	1.7% of Capital Cost
Labor Cost	2.6% of Capital Cost
Total	4.3% of Capital Cost

Considering major repairs 4% of capital cost per annum is estimated to be collected for revolving fund for operation and maintenance i.e. NRs. 800 per annum per spring.
(from Table 85 for unit quantity & cost Table 46 for typical spring protection scheme assumption)

Table 91: Estimate of Unit Operation and Maintenance Cost

Item	Unit	Input Per VMW (hr.)	Incidence Labour (hr.)	Times per Year	Annual Hours VMW (hr.)	Annual Hours Labour (hr.)	Materials (NRs.) Cost per Time ('93 price)	Materials (NRs.) Cost per Year ('93 price)
SPRING INTAKE	1 No.							
Check Need to clean		1		1	1	0		
Clean Chamber		2	2	0.5	1	1		
Check for seepage		0.1		26	2.6	0		
Measure flow		0.15		26	3 9	0		
Report condition		2		1	2	0		
Repairs		14	28	0.15	2.1	4 2	533	80
Total					12.6	5.2		80
STREAM INTAKE	1 No.							
Clean filter		7	14	1	7	14		
Clean chamber		0.4		32	12.8	0		
Check for erosion		0.15		26	3.9	0		
Measure flow		0.15		26	3.9	0		
Report condition		2		1	2	0		
Repairs		70	1400	0.1	7	140	12600	1260
Total					36.6	154		1260
PIPE LINES	1 Km.							
Inspect		0.5		26	13	0		
Repair erosion/leak		10	42	1	10	42	215	215
Report		0 3		1	0 3	0		
Total					23.3	42		215
CHAMBERS (all type)	1 Km							
Inspect (incl. drainage)		in pipes		26	0	0		
Operate valve(s)		1		4	4	0		
Repair Chamber		10	28	0 2	2	5.6	550	110
Report		0 5		1	0.5	0		
Total					6 5	5.6		110
RESERVOIRS	100 M3							
Inspect		0.8		26	20.8	0		
Check need to clean		4		2	8	0		
Clean		14	14	0 5	7	7	430	215
Maintain grounds and drains		3		12	36	0		
Report		3		1	3	0		
Total fixed					30.5	7		215
Total variable					44.3			

Table 91. Estimate of Unit Operation and Maintenance Cost (continued.)

Item	Unit	Input Per Incidence VMW (hr.)	Labour (hr.)	Times per Year	Annual Hours VMW (hr.)	Labour (hr.)	Materials (NRs.) Cost per Time ('93 price)	Materials (NRs.) Cost per Year ('93 price)
TAPSTANDS	1 No.							
Inspect (incl drain)		0 5		4	2	0		
Fit new tap washer		2		4	8	0	1.5	6
Fit new tap		2		0.3	0 6	0	194	194
Repair Tapstand					0	0		
Investigate problems		3		12	36	0		
Total					46 6	0		200
ADMINISTRATION	1 Tap							
Collect monthly dues (by WUC)				12	0	0		
Prepare accounts per tap				12	0	0		
Prepare report		7		1	7	0	200	200
Order materials		7		2	14	0		
Attend meetings		4		12	48	0		
Total					69	0		200

Source : Binnies & Partners Study 1990

Table 92: O&M estimate for Hand Pump (Shallow Tubewell)

S.N.	Item	Cost Unit NRs.	Lasting Duration	No. of Repair	Repair Cost NRs	Remarks
1	Plunger Ros	115 00	5 Years	4 00	460.00	
2	P.A. Top Plate	29 00	5 Years	4.00	116.00	
3	Ring	23.00	1 Years	20.00	460 00	
4	Botton	23.00	5 Years	4.00	92 00	
5	P.A. Washer	6 00	1/2 Years	40.00	240.00	
6	Bucket Washer (PVC)	46 00	1/4 Years	80.00	3680 00	
7	Lock Not	10.00	2 Years	10 00	100 00	
8	Rod Pin	34 00	1 Years	40.00	1360 00	
9	Fullcrum Pin	38.00	1 Years	10.00	380.00	
10	Hase head Screw	7 00	1/4 Years	80.00	560 00	
11	Flapper Valve	27 00	1 Years	20.00	540 00	
12	Valve WF	13.00	1 Years	20.00	260 00	
13	Head Bolt	10.00	10 Years	2.00	20.00	
14	Head Nut	4.00	10 Years	2.00	8.00	
15	Head Washer	5 00	1/2 Years	40 00	200 00	
16	Flat Washer	4.00	1/2 Years	40 00	160 00	
17	Hax Nut	3.00	20 Years	40 00	120.00	
18	Bush	29 00	1 Years	20.00	580 00	
19	Pump Body	715.00	20 Years	-	-	
20	Head Cover	257.00	20 Years	-	-	
21	Handle	343.00	20 Years	-	-	
22	Base Plate	214.00	20 Years	-	-	
	Total Initial Cost of Pump head				1955 00	
	Total Maintenence Cost				9565.00	
	Per Year Repair Cost				468.00	

Source : RWSSP Lumbini (FINNIDA) in 1991 Price
for Nepal No. 6 (improved) handpump

Table 92. O&M estimate for Hand Pump (Shallow Tubewell) continued

S.N.	Item	Cost Unit NRs.	Lasting Duration	No of Repair	Repair Cost NRs.	Remarks
O&M Cost in 1993 Price						
	Total Initial Cost of Pump h				2500.00	
	Total Maintenence Cost				12065 00	
	Per Year Repair Cost				600 00	
	Total Cost TW				15300.00	
	Maintenance Cost				3.9%	
	Considering platform repair 4 % of capital cost is estimated as annual O&M cost.				612	
	Monthly Maintenance Cost				51.00	

Source : RWSSP Lumbini (FINNIDA) in 1991 Price for Nepal No. 6 (improved) handpump

Note Local No 6 pump costs the less investiment . . .t by one third that for improved Nepal No. 6 but O&M cost will increse by 1 5 times.

Table 93: Community contribution for capital and O&M fund in JAKPAS implemented schemes
(Based on estimated cost available so far)

Scheme name	Household	Scheme Cost(Rs.)	O&M +capital cost (Rs.) Contribution	% cash (O&M + capital) contribution	% community contribution Kind
Dhakalthok	74	222854	5200	2 33%	27 67
Golmatar	15	193656	5000	2.58%	
Betini	35	226051	4000	1.77%	42.00
Ramche	75	400926	8315	2 07%	29 78
Sanitar	15	125421	2650	2 11%	30.53
Utringtar	56	419729	8000	1.91%	
Dansingtar	45	241455	4500	1 86%	
Average				2 09%	32 50

Table 94. Time saving in JAKPAS implemented schemes

(Based on estimated cost available so far)

Scheme name	No of HH	Time Require 1	2	3	4	5	6	7	Time (min) for roundtrip
Lamidanda	22	25	30	60	25	60			36.36
No. of HH		5	8	3	3	3			
Months source dries		12	12	12	12	12			
Hiklung Thumka	60	20	90	10	90	30	5	90	50.00
No. of HH		12	12	14	14	29	2	3	
Months source dries		3	9	3	9	12	12	12	
Thulo Basari	11	60		30					46 36
No of HH		6		5					
Months source dries		12		12					
Dhakalthok	47	20	20	20	15				18.83
No. of HH		9	4	23	11				
Months source dries		12	12	12	12				
Golmatar	15	25	60						51 25
No. of HH		15	15						
Months source dries		3	9						
Betini	35	10	60						37.14
No. of HH		16	[illegible]						
Months source dries		12	12						
Ramche	75	15	40						28.33
No. of HH		35	40						
Months source dries		12	12						
Sanitar	15	10	15						13.67
No. of HH		4	11						
Months source dries		12	12						
Utringtar	56	60	30	45					43.93
No of HH		11	15	30					
Months source dries		12	12	12					
Dansingtar	45	60	60						60.00
No. of HH		23	22						
Months source dries		12	12						
Average									20.31

Table 95: Basis for Cost Benefit Analysis of Gravity Schemes (IDA-Method)
(NRs. '000)

(a) Per Capita costs	0.89 NRs.		(d) Value of Time Saved -	30 %	full economic benefit
(b) Recurrent O&M cost	3 % of per capita cost			16 %	50 % economic benefit
(c) Software Costs	140.150 NRs.			54 %	25 %economic benefit
Population :	390	300 Present Population			
Investment Cost					

Capital Cost	347.100	NRs	Adjusted	Maintenance	NRs.	Software Costs		Adjusted	0.9 factor
	%	Factor	NRs.				NRs.	NRs.	
Materials	48	1	166 608	Recurrent O&M	10.487	Community Mob.	30 600	27 540	
Labor Skilled	5	0 9	15 620			Health/Sanit.	71.984	64.786	
Labor Unskilled	30	0.9	93.717			Non-Formal ED.	16 000	14 400	
Overhead	17	0 9	53.106			VMW Training	0 606	0.545	
Total			329 051			WUC Trg	11 500	10.350	
Sanitation	14 15		13.230 (35% Material)			Skill Development	9 46	8 514	
Catchment Prot.	8.079		7.2711						
Total			349 552			Total	140.150	126.135	
Benefits									

Gravity flow system		Savings	Unit	Rate	Unit	Value	Factor		Adjusted
				NRs.		NRs /HH/day		NRs/year	NRs./year
Time saving	3.330	3 330	Hours/Household/Day	0 040	Income/HH/Day	0.00857	0 9	156.489	140.840
Increased water	1.148	1.148	Hours/Household/Day	0 040	Income/HH/Day	0.00296	0.9	53 949	48 554

Table 96: Basis for Cost Benefit Analysis of Shallow Tubewell Schemes (IDA-Method)
(NRs. '000)

(a) Per Capita costs	0.12 NRs.		(d) Value of Time Saved -	30 %	full economic benefit
(b) Recurrent O&M cost	4 % of per capita cost			16 %	50 % economic benefit
(c) Software Costs	183.564 NRs.			54 %	25 % economic benefit
Population :	1020	600 Present Population			
Investment Cost					

Capital Cost	122.400	NRs.	Adjusted	Maintenance	NRs	Software Costs.		Adjusted	0.9 factor
	%	Factor	NRs.				NRs.	NRs.	
Materials	58	1	70.992	Recurrent O&M	6.144	Community Mob	30.600	27 540	
Labor Skilled	6	0 9	6.610			Health/Sanit.	98.354	88.519	
Labor Unskilled	19	0.9	20.930			Non-Formal ED.	32 000	28.800	
Overhead	17	0 9	18.727			VMW Training	1 650	1 485	
Total			117.259			WUC Trg.	11 500	10 350	
Sanitation	38.875		36 348 (35% Material)		-	Skill Development	9 46	8.514	
Total			153 607			Total	183.564	165.208	
Benefits									

Shallow Tubewell		Savings	Unit	Rate	Unit	Value	Factor		Adjusted
				NRs.		NRs /HH/day		NRs/year	NRs./year
Time saving	0 637	0 637	Hours/Household/Day	0 040	Income/HH/Day	0.00164	0.9	59 570	53.583
Increased water	0.162	0 162	Hours/Household/Day	0.040	Income/HH/Day	0 00042	0 9	15 226	13.703

Table 97: Basis for Cost Benefit Analysis of Deep Tubewell Schemes (IDA-Method)

(NRs. '000)

(a) Per Capita costs	0 75 NRs.	(d) Value of Time Saved -	30 %	full economic benefit
(b) Recurrent O&M cost	3 % of per capita cost		16 %	50 % economic benefit
(c) Software Costs	182.739 NRs.		54 %	25 % economic benefit
Population . 1020	600			

Investment Cost

Capital Cost	765 000 NRs %	Factor	Adjusted NRs	Maintenance	NRs.	Software Costs:	NRs.	Adjusted NRs.	0.9 factor
Materials	89	1	680.850	Recurrent O&M	23.788	Community Mob.	30 600	27 540	
Labor Skilled	0 5	0 9	3 443			Health/Sanit	98 354	88 519	
Labor Unskilled	1.5	0.9	10 328			Non-Formal ED.	32.000	28.800	
Overhead	9	0 9	61 965			VMW Training	0 825	0 743	
Total			756 585			WUC Trg.	11 500	10 350	
Sanitation	38 875		36 348 (35% Material)			Skill Development	9.46	8.514	
Total			792.933			Total	182 739	164 465	

Benefits

Deep Tubewell	Savings	Unit	Rate NRs	Unit	Value NRs /HH/day	Factor	NRs/year	Adjusted NRs /year
Time saving	0.637	Hours/Household/Day	0.040	Income/HH/Day	0.00164	0.9	59 870	53.883
Increased water use	0.162	Hours/Household/Day	0.040	Income/HH/Day	0.00042	0 9	15.226	13.703

Table 98: Basis for Cost Benefit Analysis of Dugwell Schemes (IDA-Method)

(NRs. '000)

(a) Per Capita costs	0.500 NRs.	(d) Value of Time Saved -	30 %	full economic benefit
(b) Recurrent O&M cost	3 % of per capita cost		16 %	50 % economic benefit
(c) Software Costs	182.739 NRs.		54 %	25 % economic benefit
Population . 1020	600			

Investment Cost

Capital Cost	510 000 NRs %	Factor	Adjusted NRs	Maintenance	NRs.	Software Costs	NRs.	Adjusted NRs.	0 9 factor
Materials	58	1	295.[illegible]	Recurrent O&M	15.748	Community Mob	30.600	27 540	
Labor Skilled	8	0 9	36.720			Health/Sanit.	98.354	88.519	
Labor Unskilled	17	0.9	78.030			Non-Formal ED	32.000	28.800	
Overhead	17	0 9	78.030			VMW Training	0.825	0 743	
Total			488.580			WUC Trg.	11.500	10.350	
Sanitation	38.875		36.348 (35% Material)			Skill Development	9.46	8.514	
Total			524.928			Total	182.739	164 465	

Benefits

Dugwell	Savings	Unit	Rate NRs.	Unit	Value NRs /HH/day	Factor	NRs/year	Adjusted NRs./year
Time saving	0.637	Hours/Household/Day	0 040	[illegible]/HH/Day	0 00164	0.9	59.870	53.883
Increased water use	0.162	Hours/Household/Day	0 [illegible]	[illegible]/HH/Day	0.00042	0 9	15 226	13 703

Table 99: Basis for Cost Benefit Analysis of Spring Proteciton Schemes (IDA-Method)

(NRs '000)

(a) Per Capita costs	0.350 NRs.		(d) Value of Time Saved -	30 %	full economic benefi
(b) Recurrent O&M cost	4 % of per capita cost			16 %	50 % economic benefit
(c) Software Costs	140.150 NRs.			54 %	25 % economic benefit
Population :	390	300			
Investment Cost					

Capital Cost	136.500	NRs.	Adjusted	Maintenance	NRs.	Software Costs:		Adjusted	0.9 factor
	%	Factor	NRs.				NRs.	NRs.	
Materials	45	1	61.425	Recurrent O&M	5 980	Community Mob	30.600	27 540	
Labor Skilled	4	0.9	4 914			Health/Sanit.	71.984	64.786	
Labor Unskilled	34	0.9	41.769			Non-Formal ED	16 000	14 400	
Overhead	17	0.9	20 885			VMW Training	0.606	0.545	
Total			128 993			WUC Trg	11.500	10.350	
Sanitation	14 15		13 230 (35% Material)			Skill Development	9 460	8.514	
Catchment Prot.	8.079		7 2711						
Total			149 494			Total	140.150	126.135	
Benefits									

Spring Protection	Savings	Unit	Rate	Unit	Value	Factor		Adjusted
			NRs.		NRs./HH/day		NRs,/year	NRs./year
Time saving	0.637	Hours/Household/Day	0 040	Income/HH/Day	0 00164	0.9	29 935	26.942
Increased water use	0 162	Hours/Household/Day	0.040	Income/HH/Day	0.00042	0 9	7 613	6 852

Table 100: Cost Benefit Analysis of Water Supply Schemes and WSS Project (IDA Method)

(NG. '000)

	Gravity Schemes						Shallow Tubewell					
Year	Capital Costs	O&M Costs	Software Costs	Total Cost	Total Benefits	Net Benefits	Capital Costs	O&M Costs	Software Costs	Total Cost	Total Benefits	Net Benefits
1			2,441	2,441	0	(2,441)			879	879	0	(879)
2	30,530		7,627	38,157	0	(38,157)	3,189		2,674	5,863	0	(5,863)
3	43,459	916	14,315	58,690	17,548	(41,142)	5,243	128	5,149	10,520	1,879	(8,641)
4	61,875	2,220	20,220	84,315	42,764	(41,551)	7,316	337	7,310	14,963	4,749	(10,213)
5	86,919	4,076	18,894	109,889	79,391	(30,497)	10,486	630	6,842	17,958	8,953	(9,005)
6	1,629	6,683	9,963	18,276	131,778	113,503	1,876	1,049	3,924	6,850	15,292	8,442
7		6,683		6,683	133,557	126,874		1,049		1,049	15,843	14,793
8		6,683		6,683	135,360	128,677		1,049		1,049	16,413	15,364
9		6,683		6,683	137,188	130,504		1,049		1,049	17,004	15,955
10		6,683		6,683	139,040	132,356		1,049		1,049	17,616	16,567
11		6,683		6,683	140,917	134,233		1,049		1,049	18,250	17,201
12		6,683		6,683	142,819	136,136		1,049		1,049	18,907	17,858
13		6,683		6,683	144,747	138,064		1,049		1,049	19,588	18,539
14		6,683		6,683	146,701	140,018		1,049		1,049	20,293	19,244
15		6,683		6,683	148,682	141,998		1,049		1,049	21,024	19,974
16		6,683		6,683	150,689	144,006		1,049		1,049	21,780	20,731
17		6,683		6,683	152,723	146,040		922		922	22,565	21,643
18		6,683		6,683	154,785	148,102		712		712	23,377	22,665
19		6,683		6,683	156,875	150,191		419		419	24,218	23,799
20		6,683		6,683	158,993	152,309						
21		6,683		6,683	161,139	154,455						
22		5,768		5,768	163,314	157,547						
23		4,464		4,464	165,519	161,055						
24		2,608		2,608	167,754	165,146						
PV at Disc. Rate of			10%		ERR =	[illegible]2.69%			10%		ERR =	28 16%
PV	155,034	38,675	50,443	244,152	838,079	593,927	19,142	5,328	18,334	42,803	94,477	51,673
					B/C Ratio=	3 43					B/C Ratio=	2.21

Source: Consultant's Estimate

Table 100: Cost Benefit Analysis of Water Supply Schemes and RWSS Project (IDA-Method) Continued

(NRs. '000)

Deep Tubewell						Dug Well							
Capital Costs	O&M Costs	Software Costs	Total Cost	Total Benefits	Net Benefit	Capital Costs	O&M Costs	Software Costs	Total Cost	Total Benefits	Net Benefits		
		118	118	0	(118)			118	118	0	(118)		
2,301		308	2,608	0	(2,608)	1,497		308	1,804	0	(1,804)		
3,146	69	597	3,811	225	(3,586)	2,074	45	597	2,715	225	(2,490)		
4,705	163	833	5,702	545	(5,157)	3,097	107	833	4,038	545	(3,493)		
6,291	305	778	7,374	1,049	(6,326)	4,147	200	778	5,126	1,049	(4,077)		
208	493	436	1,138	1,755	617	208	324	436	969	1,755	786		
	493		493	1,818	1,325		324		324	1,818	1,494		
	493		493	1,883	1,390		324		324	1,883	1,559		
	493		493	1,951	1,458		324		324	1,951	1,627		
	493		493	2,022	1,528		324		324	2,022	1,697		
	493		493	2,094	1,601		324		324	2,094	1,770		
	493		493	2,170	1,676		324		324	2,170	1,845		
	493		493	2,248	1,754		324		324	2,248	1,923		
	493		493	2,329	1,835		324		324	2,329	2,004		
	493		493	2,413	1,919		324		324	2,413	2,088		
	493		493	2,499	2,006		324		324	2,499	2,175		
	424		424	2,589	2,165		280		280	2,589	2,310		
	330		330	2,683	2,353		217		217	2,683	2,465		
	189		189	2,779	2,590		124		124	2,779	2,655		
		10%		ERR =	3.31%			10%		ERR =	9.18%		
11,503	2,516	2,108	16,127	10,862	(5,265)	7,603	1,654	2,108	11,366	10,862	(504)		
				B/C Ratio=	0.67					B/C Ratio=	0.96		

Table 10D: Cost Benefit Analysis of Water Supply Schemes and RWS Project (IRR Method) continued

(NRs. '000)

Spring Protection | Other Project Costs

Capital Costs	O&M Costs	Software Costs	Total Cost	Total Benefits	Net Benfits	Other Project Cost	Total All Scheme Costs	All Scheme Benefits	Net Benefits Water Alone	Net Benefits Total Project	Net Scheme Benefits Excluding Software
		144	144	0	(144)	30,882	3,700	0	(3,700)	(34,582)	(0)
715		400	1,115	0	(1,115)	28,433	49,547	0	(49,547)	(77,980)	(38,231)
890	29	756	1,675	176	(1,499)	38,017	77,412	20,054	(57,358)	(95,375)	(35,945)
1,469	64	1,039	2,572	392	(2,180)	31,951	111,590	48,995	(62,594)	(94,545)	(32,359)
1,781	123	965	2,869	759	(2,110)	19,991	143,215	91,200	(52,015)	(72,006)	(23,758)
78	194	478	751	1,209	458	29,343	27,983	151,789	123,806	94,463	139,043
	194		194	1,225	1,031		8,745	154,261	145,516	145,516	145,516
	194		194	1,241	1,047		8,745	156,782	148,037	148,037	148,037
	194		194	1,258	1,064		8,745	159,352	150,608	150,608	150,608
	194		194	1,275	1,081		8,745	161,974	153,229	153,229	153,229
	194		194	1,292	1,098		8,745	164,648	155,903	155,903	155,903
	194		194	1,310	1,116		8,745	167,376	158,631	158,631	158,631
	194		194	1,328	1,133		8,745	170,158	161,414	161,414	161,414
	194		194	1,345	1,151		8,745	172,997	164,253	164,253	164,253
	194		194	1,364	1,169		8,745	175,894	167,149	167,149	167,149
	194		194	1,382	1,188		8,745	178,850	170,106	170,106	170,106
	194		194	1,401	1,207		8,503	181,867	173,364	173,364	173,364
	194		194	1,420	1,225		8,137	184,947	176,810	176,810	176,810
	194		194	1,439	1,245		7,610	188,090	180,480	180,480	180,480
	194		194	1,458	1,264		6,878	160,451	153,573	153,573	153,573
	194		194	1,478	1,284		6,878	162,617	155,739	155,739	155,739
	166		166	1,498	1,332		5,933	164,812	158,879	158,879	158,879
	130		130	1,518	1,388		4,594	167,037	162,443	162,443	162,443
	71		71	1,539	1,467		2,679	169,292	166,613	166,613	166,613
		10%		ERR =	11.27%			ERR =	37.22%	24.54%	51.12%
3,413	1,127	2,608	7,149	,717	568	130,935	321,597	961,997	640,400	509,465	716,002
									All Schemes -Total Project		
				B/C Ratio=	1.08			B/C Ratio=	2.99	2.13	

Table 101: Cost Benefit Analysis of Water Supply Schemes and RWSS Project (MOF-Method)

(NRs '000)

	Gravity Schemes						Shallow Tubewell					
Year	Capital Costs	O&M Costs	Software Costs	Total Cost	Total Benefits	Net Benefits	Capital Costs	O&M Costs	Software Costs	Total Cost	Total Benefits	Net Benefits
1			2,712	2,712	0	(2,712)			976	976	0	(976)
2	32,708		8,474	41,182	0	(41,182)	3,527		2,971	6,498	0	(6,498)
3	46,488	981	15,905	63,374	19,498	(43,876)	5,730	141	5,722	11,593	2,088	(9,505)
4	66,188	2,376	22,467	91,030	47,515	(43,515)	7,992	370	8,122	16,484	5,277	(11,207)
5	92,975	4,362	20,993	118,330	88,212	(30,118)	11,460	690	7,602	19,752	9,948	(9,804)
6	1,543	7,151	11,070	19,764	146,420	126,657	1,876	1,148	4,360	7,385	16,991	9,606
7		7,151		7,151	148,397	141,246		1,148		1,148	17,603	16,455
8		7,151		7,151	150,400	143,250		1,148		1,148	18,237	17,088
9		7,151		7,151	152,431	145,280		1,148		1,148	18,893	17,745
10		7,151		7,151	154,489	1[illegible],338		1,148		1,148	19,573	18,425
11		7,151		7,151	156,574	149,424		1,148		1,148	20,278	19,130
12		7,151		7,151	158,688	151,537		1,148		1,148	21,008	19,860
13		7,151		7,151	160,830	153,680		1,148		1,148	21,764	20,616
14		7,151		7,151	163,002	155,851		1,148		1,148	22,548	21,399
15		7,151		7,151	165,202	158,051		1,148		1,148	23,360	22,211
16		7,151		7,151	167,432	160,282		1,148		1,148	24,200	23,052
17		7,151		7,151	169,693	162,542		1,007		1,007	25,072	24,064
18		7,151		7,151	171,983	164,833		778		778	25,974	25,196
19		7,151		7,151	174,305	167,155		458		458	26,909	26,451
20		7,151		7,151	176,658	169,508						
21		7,151		7,151	179,043	171,893						
22		6,170		6,170	181,460	175,291						
23		4,775		4,775	183,910	179,135						
24		2,789		2,789	186,393	183,604						
PV at Disc Rate of			15%		ERR =	43 96%			15%		ERR =	28.44%
PV	140,034	25,915	47,293	213,241	568,807	355,566	17,513	3,824	17,166	38,503	66,255	27,752
					B/C Ratio=	2.67					B/C Ratio=	1.72

Table 101: Cost Benefit Analysis of Water Supply Schemes and RWSS Project (NOI-Method) Continued

(NRs '000)

Deep Tubewell Capital Costs	O&M Costs	Software Costs	Total Cost	Total Benefits	Net Benefit	Dug Well Capital Costs	O&M Costs	Software Costs	Total Cost	Total Benefits	Net Benefits
		131	131	0	(131)			131	131	0	(131)
2,726		342	3,068	0	(3,068)	1,673		342	2,015	0	(2,015)
3,713	82	663	4,457	251	(4,207)	2,309	50	663	3,022	251	(2,772)
5,556	193	926	6,675	606	(6,069)	3,451	119	926	4,496	606	(3,391)
7,425	360	865	8,650	1,165	(7,485)	4,619	223	865	5,707	1,165	(4,541)
208	583	484	1,276	1,950	674	208	362	484	1,055	1,950	875
	583		583	2,020	1,437		362		362	2,020	1,658
	583		583	2,093	1,510		362		362	2,093	1,731
	583		583	2,168	1,585		362		362	2,168	1,807
	583		583	2,246	1,664		362		362	2,246	1,885
	583		583	2,327	1,744		362		362	2,327	1,965
	583		583	2,411	1,828		362		362	2,411	2,049
	583		583	2,498	1,915		362		362	2,498	2,136
	583		583	2,587	2,005		362		362	2,587	2,226
	583		583	2,681	2,098		362		362	2,681	2,319
	583		583	2,777	2,195		362		362	2,777	2,416
	501		501	2,877	2,376		311		311	2,877	2,566
	389		339	2,981	2,591		242		242	2,981	2,739
	223		223	3,088	2,865		139		139	3,088	2,949
		15%		ERR =	2.48%			15%		ERR =	9.16%
11,460	1,953	1,977	15,390	7,622	(7,768)	7,143	1,211	1,977	10,332	7,622	(2,710)
				B/C Ratio=	0.50					B/C Ratio=	0.74

Table 101: Cost Benefit Analysis of Water Supply Schemes and RWSS Project (MOF-Method) Continued.

(Nfa. '000)

Spring Protection

Other Project Costs

Capital Costs	O&M Costs	Software Costs	Total Cost	Total Benefits	Net Benfits	Other Project Cost	Total All Scheme Costs	All Scheme Benefits	Net Benefits Water Alone	Net Benefits Total Project	Net Scheme Benefits Excluding Software
		160	160	0	(160)	34,313	4,111	0	(4,111)	(38,424)	(0)
751		445	1,196	0	(1,196)	31,593	53,959	0	(53,959)	(85,551)	(41,385)
933	30	840	1,803	195	(1,607)	42,241	84,249	22,282	(61,968)	(104,209)	(38,175)
1,540	67	1,155	2,762	436	(2,326)	35,501	121,448	54,439	(67,008)	(102,509)	(33,413)
1,865	129	1,072	3,066	843	(2,223)	22,212	155,505	101,334	(54,171)	(76,383)	(22,774)
74	204	531	809	1,343	534	32,603	30,288	168,654	138,367	105,764	155,297
	204		204	1,361	1,157		9,447	171,401	161,954	161,954	161,954
	204		204	1,379	1,176		9,447	174,202	164,755	164,755	164,755
	204		204	1,398	1,194		9,447	177,058	167,611	167,611	167,611
	204		204	1,417	1,213		9,447	179,971	170,524	170,524	170,524
	204		204	1,436	1,232		9,447	182,942	173,495	173,495	173,495
	204		204	1,455	1,252		9,447	185,973	176,526	176,526	176,526
	204		204	1,475	1,271		9,447	189,065	179,618	179,618	179,618
	204		204	1,495	1,291		9,447	192,219	182,772	182,772	182,772
	204		204	1,515	1,312		9,447	195,438	185,991	185,991	185,991
	204		204	1,536	1,332		9,447	198,723	189,276	189,276	189,276
	204		204	1,556	1,353		9,174	202,075	192,901	192,901	192,901
	204		204	1,577	1,374		8,764	205,496	196,733	196,733	196,733
	204		204	1,599	1,395		8,174	208,989	200,815	200,815	200,815
	204		204	1,620	1,417		7,354	178,279	170,924	170,924	170,924
	204		204	1,642	1,439		7,354	180,685	173,331	173,331	173,331
	174		174	1,664	1,491		6,343	183,125	176,782	176,782	176,782
	136		136	1,687	1,551		4,911	185,597	180,686	180,686	180,686
	75		75	1,710	1,635		2,864	188,102	185,239	185,239	185,239
		15%		ERR =	11 90%			ERR =	38 03%	24.39%	52.64%
3,021	741	2,450	6,213	5,245	(968)	126,937	283,679	655,551	371,372	244,935	442,736
									All Schemes	-Total Project	
				B/C Ratio=	0 84			B/C Ratio=	2.31	1 60	