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THE MINYAMBOU COMMUNITY DEVELOPMENT WATER PROJECT IN IRIAN JAYA, INDONESIA

WASH FIELD REPORT NO. 90

JUNE 1983

Prepared For:
USAID Mission to the Republic of Indonesia
Order of Technical Direction No. 133

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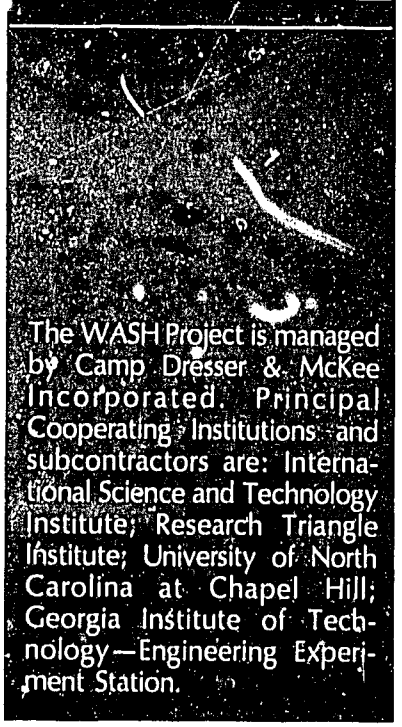

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June 15, 1983

Mr. William P. Fuller, Director
USAID Mission
Jakarta, Indonesia

Attention: Mr. Walter North

Dear Mr. North:

On behalf of the WASH Project I am pleased to provide you with 10 (ten) copies of a report on The Minyambou Community Development Water Project in Irian Jaya, Indonesia.

This is the final report by Scott Faiia and is based on his trip to Indonesia from April 10 to 28, 1983.

This assistance is the result of a request by the Mission on December 22, 1982. The work was undertaken by the WASH Project on February 7, 1983 by means of Order of Technical Direction No. 133, authorized by the USAID Office of Health in Washington.

If you have any questions or comments regarding the findings or recommendations contained in this report we will be happy to discuss them.

Sincerely,

Dennis B. Warner

Dennis B. Warner, Ph.D., P.E.
Director
WASH Project

cc. Mr. Victor W.R. Wehman, Jr., P.E., R.S.
AID WASH Project Manager
S&T/H/WS

DBW:cdej

WASH FIELD REPORT NO. 90

THE MINYAMBOU COMMUNITY DEVELOPMENT WATER PROJECT IN IRIAN JAYA, INDONESIA

Prepared for the USAID Mission to the Republic of Indonesia
under Order of Technical Direction No. 133

Prepared by:

A. Scott Faiia

June 1983

Water and Sanitation for Health Project
Contract No. AID/DSPE-C-0080, Project No. 931-1176
Is sponsored by the Office of Health, Bureau for Science and Technology
U.S. Agency for International Development
Washington, DC 20523

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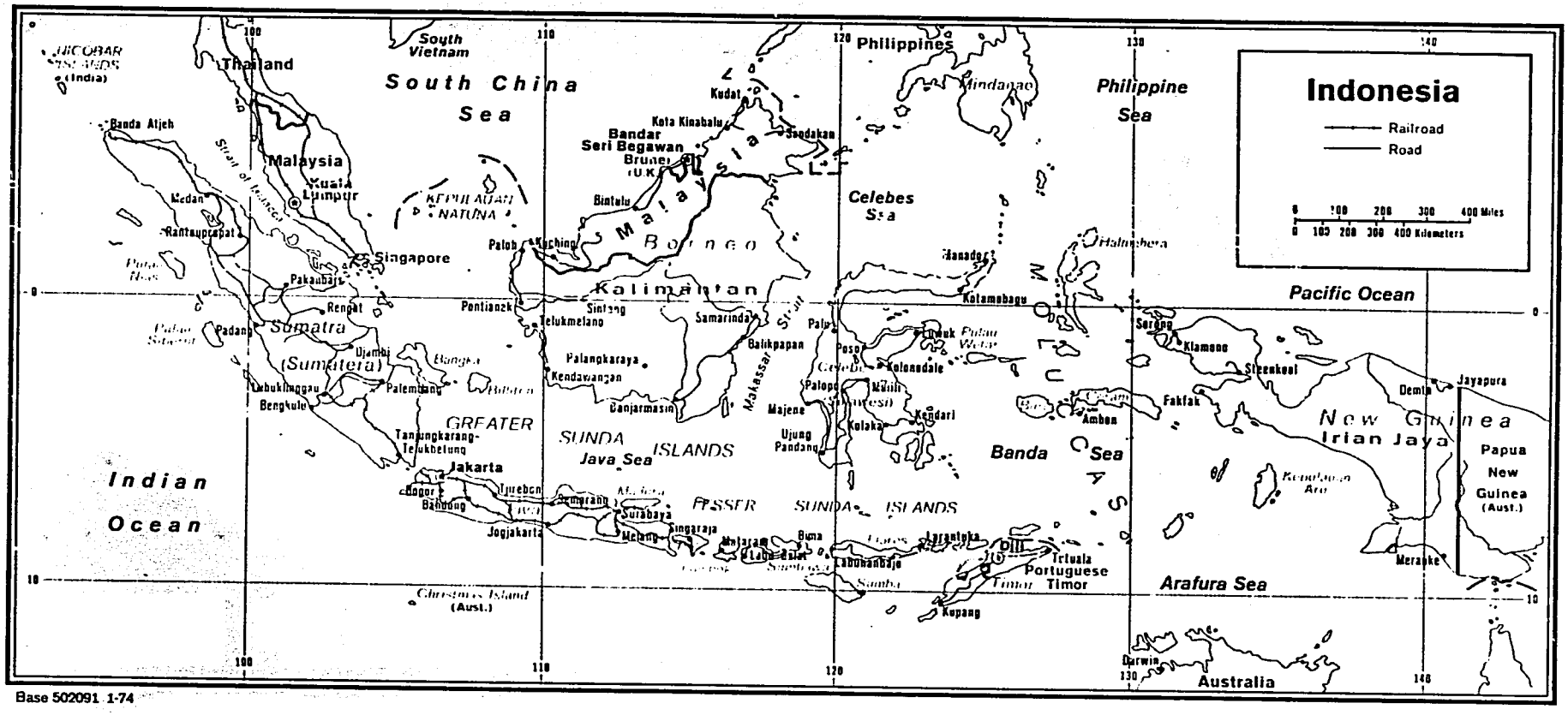
ACKNOWLEDGEMENT

The field work and the completion of this report would not have been possible without the assistance of USAID Indonesia, World Relief, the Evangelical Alliance Mission (TEAM), the Asia Foundation, and the Irian Jaya Development Information Service Center (IJDISC), all of whom provided support and encouragement. All concerned organizations and individuals were completely open in the discussion of ideas and recommendations. Likewise all are committed to taking any necessary action to ensure successful project implementation. Sincere thanks are extended to all concerned.

Special thanks are due to all those who provided logistical support and companionship during the fieldwork, particularly the Millers of TEAM Manokwari and the staff of the IJDISC in Abepura.

The assistance of Mr. Jonathan Mitchell of VSO Indonesia who prepared the pipe selection chart and technical drawings is gratefully acknowledged.

Acknowledgement is also due to Walter North of USAID Jarkarta for his assistance and encouragement.



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Chapter 1

INTRODUCTION

This work came about as a result of a request from the Private Voluntary Office of the USAID Mission in Jakarta (Jakarta 18964 dated December 22, 1982) asking if WASH would support the services of Scott Faiia as a consultant to several private voluntary agencies in Irian Jaya to whom the Mission was contemplating grants to carry on water supply and sanitation projects. With some delay secondary to minor administrative problems, Mr. Faiia was approved as a consultant and the request became the basis of Order of Technical Direction No. 133 issued on February 7, 1983.

This report is based on a field trip to Irian Jaya during 10-28 April 1983. The Jayapura area on the Northeast Coast and the Manokwari area on the northwest coast were visited. Discussions were held with villagers, government officials, missionaries, and members of development groups. A one-week practical training session on source selection and measurements was held for 12 villagers in the Manokwari area and construction of one gravity flow water system was initiated. Sites of several proposed water systems were investigated. The specific tasks involved were to advise the Minyambou Community Development Project on technical, economic, and social options for its 68 planned rural water systems and to discuss technical, economic, and social options for water supply in Irian Jaya with the Irian Jaya Development Information Service Center.

The report begins with a summary of the major recommendations for the Minyambou water project followed by a more detailed discussion of the project. This is followed by a discussion of the possible role of the Irian Jaya Development Information Service Center in relation to water supply. The last section contains a summary of general observations regarding water supply in Irian Jaya. The appendices include an itinerary, a list of persons contacted, suggested technical designs of water system components for the Minyambou area, and a list of reference materials supplied to TEAM and the Irian Jaya Development Information Service Center.

Chapter 2

MAJOR RECOMMENDATIONS FOR THE MINYAMBOU COMMUNITY DEVELOPMENT WATER PROJECT

1. In view of the extreme underdevelopment of the area, the Minyambou project should not be approached from the point of view of solely providing water but as an opportunity for significant development.

2. Training activities for local people should be incorporated into the project, particularly in basic masonry, to increase developmental impact and overcome problems in obtaining skilled labor.

3. A person experienced in implementing simple village level water systems should be assigned to coordinate and supervise project implementation.

4. The present implementation schedule is unrealistic and should be revised. Physical targets for system completion should not be adopted until the second year.

5. The budget should be revised to account for training and personnel needs.

6. Complete design information for all of the 68 proposed systems should be collected during the first year of implementation.

7. Initially installed systems should be closely monitored and several options tested and the information used for design modification.

Chapter 3

MINYAMBOU COMMUNITY DEVELOPMENT WATER PROJECT

3.1 General

3.1.1 Project Description

The Minyambou Community Development Water Project is sponsored by World Relief and has a total budget of $289,542 for the two-year life of the project. USAID Indonesia is supporting the effort through a $145,221 locally administered co-financing grant. The implementing agency is TEAM (the Evangelical Alliance Mission) which also has other community development activities in the area. The objective of the water project is to improve health through the construction of water systems and training health cadres. The planned targets for construction of water systems are 28 during 1983 and 40 during 1984 which will provide water to 10,745 people. Community size ranges from 6 to 70 houses. The overwhelming majority of the water systems will be spring fed gravity flow systems, and the technical comments in this report are limited to this type of system. The use of latrines is promoted, but no material assistance is given for their construction.

3.1.2 Project Area

The following description of the project area is intended to present a general idea of prevalent physical, social, and economic conditions. It is necessary to be aware of these because the extreme underdevelopment in Irian Jaya will have a profound effect on project design and implementation.

The Minyambou area is relatively rugged with mountains rising up to 3,000 meters. There are very few, if any, flat areas and consequently even most airstrips are constructed on grades of 8 to 12 percent. Except for the coastal area around the district capital of Monokwari there are no roads. Minyambou itself is a 15 minute flight or a two day walk from Manokwari. There are no regular flight schedules and arrangements must be made beforehand with the Missionary Aviation Fellowship which serves the entire Bird's Head Area with one Cessna and a small helicopter. Most project materials will be taken to Minyambou in the Cessna but the capacity is limited (about 600 kgs or 12 bags of cement per load) and the cost high (Rp. 188 per kg.). Miyambou is the site of only one of the water systems and for the others materials must be transported from Minyambou over mountain trails. The furthest project sites are up to 5 days walk from Minyambou.

The cash economy is extremely underdeveloped. There are no stalls or stores operating in any of the mountain villages except for the kiosk at the Mission station. All goods are relatively expensive when available. The price of cement is Rp. 4,750 per sack in Monokwari and an additional Rp. 7,100 for transport to Minyambou. The price in Java is about Rp. 3,500 or one fourth that of Minyambou. The daily wage rate is Rp. 200 to 300 but there really is

no work available except for the small number of people employed by the community development project and the mission station in Minyambou itself. There is no skilled labor available in the area except for several carpenters in Minyambou.

Concrete is generally not found outside the mission station and zinc roofs are generally very rare outside the immediate area of Minyambou. Most people possess only one set of clothing. There is a severe shortage of containers for carrying, storing, and boiling water. Most families have one container only and it is used for cooking. The staple food is sweet potatoes, and diets are typically short of protein, fat, and calories. Soap is a definite luxury. As a result of these factors infant mortality is an exceptionally high 37.5 percent as compared to 14 percent for Indonesia as a whole and less than 2 percent for Western Europe. According to Minyambou clinic records 34 percent of diseases treated in the area are waterborne or caused by the lack of water.

In some villages the people have constructed gravity flow water systems using bamboo and this is encouraging. However, these systems do not function efficiently, the amount of water supplied is limited, frequent repairs are necessary, and there is no source protection.

The above conditions prevail for approximately 70 percent of the project villages. The remaining villages are closer to the coast and are accessible by road. They are somewhat better developed but still among the least developed in Indonesia.

3.2 Planning and Preparation

3.2.1 Personnel

At present there is no specific person assigned to coordinate and direct activities in the water project. It was originally planned that Dr. Michael Bah would join the project and assume those duties. However, just as his visa was approved he had to decline for personal reasons. It is strongly recommended that a replacement with some experience or technical background be obtained. It is unlikely that there is anyone suitable in Irian Jaya itself but without such a person progress in completing water systems may be unacceptably slow. There are two possibilities that should be investigated, i.e. a VSO or a VIA volunteer. If a suitable volunteer is not available then someone should be obtained through normal commercial channels. Unless they have sufficient prior experience with rural water systems in Indonesia it is recommended that this person should spend a minimum of one month studying water systems in the CARE office in Nasa Tenggara Bharat (NTB) before beginning work. The project should also contact the agricultural engineer stationed at Cenrawasih University in Manokwari for advice and assistance. At the moment he is following the six month Dian Desa training course in water supply and should return in October 1983. He can be contacted through the Irian Jaya Development Information Service Center.

The provision of skilled labor for project implementation will also be a problem. There have been difficulties in obtaining skilled labor willing to work in Minyambou itself, and it is unlikely that any outsider will be willing to travel to and work in most of the outlying areas which may be as much as five days walk from Minyambou. Original plans were to use an outside mason who had previously worked in the area and seemed suitable for the job. Unfortunately, this person had to leave the area for personal reasons, and it is unlikely that a suitable replacement can be obtained at all. The best alternative is to think in terms of upgrading the skills of the local people through some kind of training. CARE Indonesia is willing to assist in this process through providing practical training in project implementation in NTB province. One local person from Minyambou has already arrived in NTB and if other suitable candidates are found they can also be trained. At the same time opportunities for training within Irian Jaya itself can be further explored. The upgrading of local capabilities in the area can be an important benefit realized from this project.

3.2.2 Implementation Schedule

The project proposal plans the completion of 68 water systems over a two year period. Even under the best of conditions this would be a formidable task. The unique situation of Irian with all its transport difficulties, low absorptive capacity, lack of skilled labor, and lack of infrastructure make it all the more difficult. This, together with the unavailability of two key project personnel, make the plan highly unrealistic. It would be best if the entire time frame for the project were reconsidered. In doing so it should be borne in mind that this project has implications far beyond just the mere provision of water and it can truly be an exercise in the development of a people and their area. It can provide valuable insights and experience applicable to the province as a whole. In view of the extreme underdevelopment of the area this is of considerable importance. Since achievement of material objectives is so dependent on the provision of appropriate training, the capacity of the indigenous people to absorb both knowledge and change, and the availability of certain key personnel, it is recommended that no material objectives be adopted for the first year of implementation and that targets for the second year be determined after some of the key issues regarding personnel are resolved. By early in the second year of implementation it should be possible to develop a reasonable time frame for provision of water to all 68 villages should adequate resources be available.

3.2.3 Budgets

The proposed budgets for materials and equipment are very reasonable both in terms of accuracy and per capita costs (approximately $14 per person served for materials only). Quantities of cement are a bit underestimated and there is no adequate provision for certain items such as break pressure tanks, air release valves, and control valves. At present prices nearly all of the necessary materials for the 68 systems could be purchased with the proposed materials budget. However, the budget contains no provisions for skilled labor or training costs. The provision for salaries of field workers is probably inadequate to cover these costs especially since transportation and per diems for training purposes can be considerable. It is strongly recommended that any

necessary funds for training or additional personnel be transferred from the materials budget and that when the implementation schedule is re-assessed at the beginning of the project's second year an estimate of the number of systems that can be completed with the remaining funds can be made based on prevailing prices and progress up to that point.

3.2.4 Source Selection and Design Data

The calculated budgets are based on surveys carried out in 30 of the 68 project communities. These surveys give a good idea of community size, the availability of springs, and approximate distances to the community. They do not include information on spring flow or elevations. During the field work for this report 12 villagers attended a week-long training program during which source selection and measurements of spring flow, distance, and elevation were covered. During such a short period they were not able to fully absorb this information. However, several of the participants did seem to understand well enough to be able to begin collecting this information under the supervision of Mr. Mahidin of the Community Development Project Staff. If this information is collected for a portion of the systems then implementation can begin immediately upon the return of any trainees. During the first year information should be collected for all 68 communities so that a reasonable plan can be prepared for the remainder of the project.

Regarding the above information the suggested criteria for source selection are as follows:

- The source is higher in elevation than the community.
- The source has enough water to meet the communities needs. (This can be determined by project personnel based on the flow measurements supplied by the villagers.)
- The source did not go dry during the 1982 dry season.
- The water is clean.
- The source is not subject to flooding due to heavy rains.
- There is a reasonable path for the pipeline between the source and the community, e.g. no major river or valley crossings and the pipe can be buried.
- The source should be reasonably close to the community. The villagers should choose the nearest source that fulfills all the above criteria.

3.3 Water System Design and Implementation

3.3.1 Basic Considerations

The main considerations in designing the project's water systems should be the following:

- o To improve the quality of water available.
- o To increase the quantity of water available.
- o To increase access to water through bringing it closer to the point of use.
- o To allow for future changes such as increased usage.
- o To overcome difficulties in construction due to transport, terrain, and lack of skilled labor.

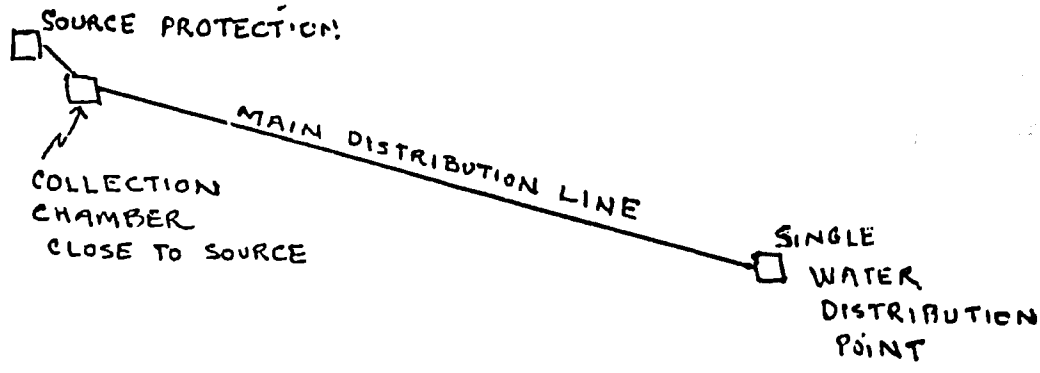
In applying the above considerations it must be emphasized that the project area is undergoing rapid changes and it is not yet clear how the people will adapt to a new source of water and what changes the water system may cause in their water use habits. What is an appropriate design at this point in time may not be appropriate in five or even one year's time. Thus, although the initial designs may be appropriate, all completed systems should be closely monitored to observe changes in usage and obtain information for future designs. The first systems should be regarded as models for experimentation and observation rather than as examples to be replicated in all villages. In the initial stages several options should be tested and compared. For example, the acceptance of faucets, location and number of water points, provision of private bathing areas, and design of the water distribution point can be tested and evaluated. Thus, the following comments should be considered as suggestions and flexible guidelines.

3.3.2 Possible System Configurations

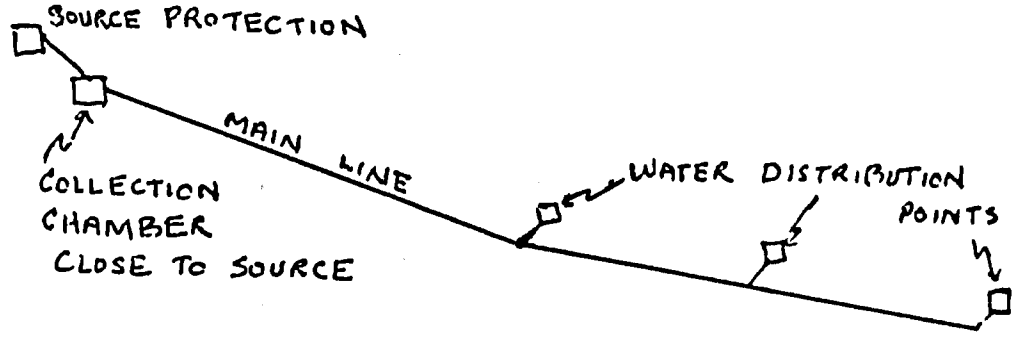
The most appropriate system configuration cannot yet be determined. Several possibilities are outlined in Figure 1. It is suggested that option 1a be used for communities of up to 15 houses. Option 1b would be preferable for larger communities with provision of one distribution point for each 10 to 15 houses spaced according to population density. Any system with more than one distribution point should have globe valves at each point in order to regulate and distribute the flow evenly.

After construction of the first few systems observation will indicate what is most acceptable for the area. Option 1c is not recommended at this time unless the yield of the source is too small (i.e. less than the desired design flow). This option would require faucets in order for the storage to be effective and the construction of the storage reservoirs will be both difficult and expensive. Initially the distribution points for options 1a and 1b should be free flowing public standposts. Other possibilities include adding faucets, small reservoirs, or bathing rooms for privacy. Any distribution point should

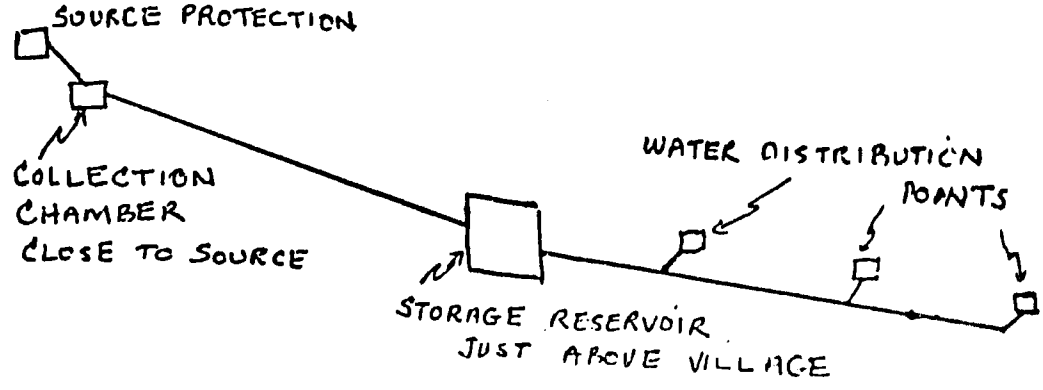
FIGURE 1



1 a). It would be best if the water distribution point were a small standpost with a concrete pad. A Faucet, small reservoir, or bathing area would be optional.



1 b). With this system it is important that each distribution point have a control valve to adjust the flow and distribute it equally. Normally the lowest point is adjusted first to the desired flow, then the next lowest, and so on until all flows are correct. Faucets are optional.



1 c). As in 1b each distribution point must have a control valve. Faucets are also required or the storage will be meaningless. This type of design should be used when the flow of the source is not sufficient or for longer pipelines because the pipe can be smaller than a comparable system without storage.

have a concrete or stone pad for a washing area and proper drainage. Suggesed dimensions are included in the standard drawings in Appendix D. Configurations 1a and 1b could be converted to configuration 1c by the addition of a storage reservoir if it is desirable to increase the amount of water available in the future.

3.3.3 Design Parameters

Design flows

The desired quantity of water to be used in the village will indicate the design flow. Usage is quite low at present and can be expected to increase when water becomes more easily accessible. Initially a figure of 30 liters per person per day is recommended. Observation of the first few systems will indicate whether this amount is appropriate. For system configurations in figures 1a and 1b, with no storage, the design flow in liters per second would then be 30 liters per person per day times the number of persons times 4 (the peak load factor because there is no storage) times 1.33 (population growth factor) divided by 86,400 or .0018 times the present population. For configuration 1c with storage a peak load factor of 2 rather than 4 should be used.

Pipe Selection

The project already has on site 12,000 meters of flexible PVC pipe. This was an appropriate choice of pipe because it is lower in cost, easier to install, and easier to transport into the interior on light aircraft. It is recommended that the pipe size be determined using Table 1, the PVC Pipe Selection Chart.

In using the table the flow utilized should be equal to the design flow or the nearest one that is higher. Similarly, the gradient should be the same or the next flattest (greater denominator). This will ensure that the minimum desired flow will be obtained, but in most cases the flow obtained will be greater.

Distribution Points

The number of distribution points should be in the range of one for each 10 to 15 houses. They should consist of one discharge point of steel pipe firmly anchored in concrete. Faucets are not necessary unless storage is used and are not recommended but should be installed in at least one system for comparative purposes. Each distribution point should have a concrete or stone pad for use as a washing area and proper drainage. A small enclosure of bark walls can be installed to provide privacy and thus encourage people to bathe. Drawings of a typical distribution point are included in Appendix D.

Storage

Because of transport difficulties, the high cost of cement, and the lack of skilled labor, the use of storage reservoirs should be minimized. Storage will not normally be required unless the design flow is greater than the minimum flow of the spring source. If this occurs then the design flow should be calculated using a peak load factor of 2. If the source flow is less than this then the source is not adequate. If storage is necessary, then for systems

Table 1

PIPE SELECTION CHART FOR PVC PIPE

GRADIENT(M/M)	REQUIRED FLOWRATE (LITRE/SECOND)									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
1:10	½	¾	¾	1	1	1	1	1¼	1¼	1¼
1:20	½	¾	1	1	1¼	1¼	1¼	1¼	1¼	1½
1:30	¾	¾	1	1	1¼	1¼	1¼	1½	1½	1½
1:40	¾	1	1	1¼	1¼	1¼	1½	1½	1½	1½
1:50	¾	1	1¼	1¼	1¼	1¼	1½	1½	1½	1½
1:60	¾	1	1¼	1¼	1¼	1½	1½	1½	1½	1½
1:70	¾	1	1¼	1¼	1½	1½	1½	1½	2	2
1:80	¾	1	1¼	1¼	1½	1½	1½	1½	2	2
1:90	¾	1	1¼	1¼	1½	1½	1½	2	2	2
1:100	¾	1	1¼	1½	1½	1½	1½	2	2	2
1:110	¾	1¼	1¼	1½	1½	1½	2	2	2	2
1:120	¾	1¼	1¼	1½	1½	1½	2	2	2	2
1:130	1	1¼	1¼	1½	1½	1½	2	2	2	2
1:140	1	1¼	1¼	1½	1½	1½	2	2	2	2
1:150	1	1¼	1¼	1½	1½	2	2	2	2	2
1:160	1	1¼	1¼	1½	1½	2	2	2	2	2
1:170	1	1¼	1½	1½	1½	2	2	2	2	3
1:180	1	1¼	1½	1½	1½	2	2	2	2	3
1:190	1	1¼	1½	1½	1½	2	2	2	2	3
1:200	1	1¼	1½	1½	1½	2	2	2	2	3
1:250	1	1¼	1½	1½	2	2	2	2	3	3
1:300	1	1¼	1½	1½	2	2	2	3	3	3
1:400	1¼	1½	1½	2	2	2	3	3	3	3
1:500	1¼	1½	1½	2	2	3	3	3	3	3

NOTES :

1. All pipe sizes in inches diameter.
2. To determine gradient : Gradient = pipe length/head drop measured over the pipe length. Example : pipe length = 400 meters, head drop = 9.5 meters; pipe length /Head drop = 42.1, hence gradient = 1:42.1
3. Always round up gradient to the next highest gradient listed on the chart. E.g. for 42.1 use listed gradient of 1:50.
4. Actual flows will usually be greater than listed flows.

Prepared by Jon Mitchell, VSO
1983

serving up to 30 families a storage reservoir of 3 cubic meters should be constructed. A standard design for this is included in Appendix D. For more than 30 families two such reservoirs can be constructed adjacent to each other with one common wall. For systems initially constructed without storage reservoirs some storage capacity can be added at a later date to increase the availability of water if necessary.

3.3.4 Other Considerations

Community Participation

Community participation will be essential to the success of this project. A heavy reliance is placed on the community to transport materials from Minyambou to their villages and all work is to be done by voluntary labor which will be supervised by the community development project staff. Community participation will also be very important in terms of maintenance and future repairs because there is no one else available to carry out these tasks.

There appears to be a high level of enthusiasm and support for the water systems among the villagers. However, directing them to work in an organized, efficient, and correct manner will not be easy. The following suggestions are offered based on experience in other parts of Indonesia:

- Before beginning work or taking design measurements thoroughly discuss with the entire community the type of system to be constructed, the placement and number of water distribution points, the amount of work required from them, future maintenance requirements, and the reasons for constructing the system. They should understand the possible benefits and not have false expectations regarding benefits or the level of service to be provided. The concept that benefits include the opportunity to progress as a community and obtain new skills should also be discussed. If there is no strong group consensus supporting the system then the area should be placed on a "waiting list" while systems are first built in more receptive communities.

- Members of the community should take an active role in the design measurements and selecting locations for the water distribution points. The necessity for fair and equitable distribution should be stressed.

- A committee of several informal leaders should be formed in order to organize the work. Division of work should be equitable, e.g. each family assigned to provide a specific amount of rock or sand or a specified length of trenching.

- No work should begin until all of the local materials to be provided by the community are on site.

- As planned in the project proposal two persons from each community should be given specific training concerning maintenance and repair.

- The plan for a payment of Rp. 1,200 from each family should be continued. However, the management and use of these funds should be determined beforehand and clearly understood by all concerned. People should understand clearly that this payment does not entitle them to a private connection or relieve them of their responsibility to assist in construction.

- When several systems are successfully completed they can be used as an example to those communities on the "waiting list."

If the project encourages community participation in its broader sense, rather than merely the provision of labor and materials, the chances of success and the benefits in terms of community development will be considerably greater.

Technical Considerations

The following are some technical suggestions concerning design and implementation:

1. The source should be completely protected so that contaminated water cannot enter and it will not be disturbed by animals such as wild boar.

2. In constructing the source protection system the flow of water to the collection chamber should be completely unobstructed and there should be no standing water within the protected area.

3. The area around the source should be fenced off for a distance of at least 10 meters and agricultural activities prohibited in the immediate area in order to reduce the possibility of landslides.

4. Collection tanks and reservoirs should always have a cleanout pipe made from a 60 cm piece of 2-inch steel pipe. The pipe should have a 20 cm piece of steel reinforcing rod welded in the center to firmly anchor it in the wall. This cleanout pipe is particularly important for the collection chamber because of the possible presence of sand in springs. The collection chambers should be frequently inspected and cleaned if necessary.

5. Collection tanks and reservoirs should always have a screened overflow. This can be made of PVC as shown in Figure 2.

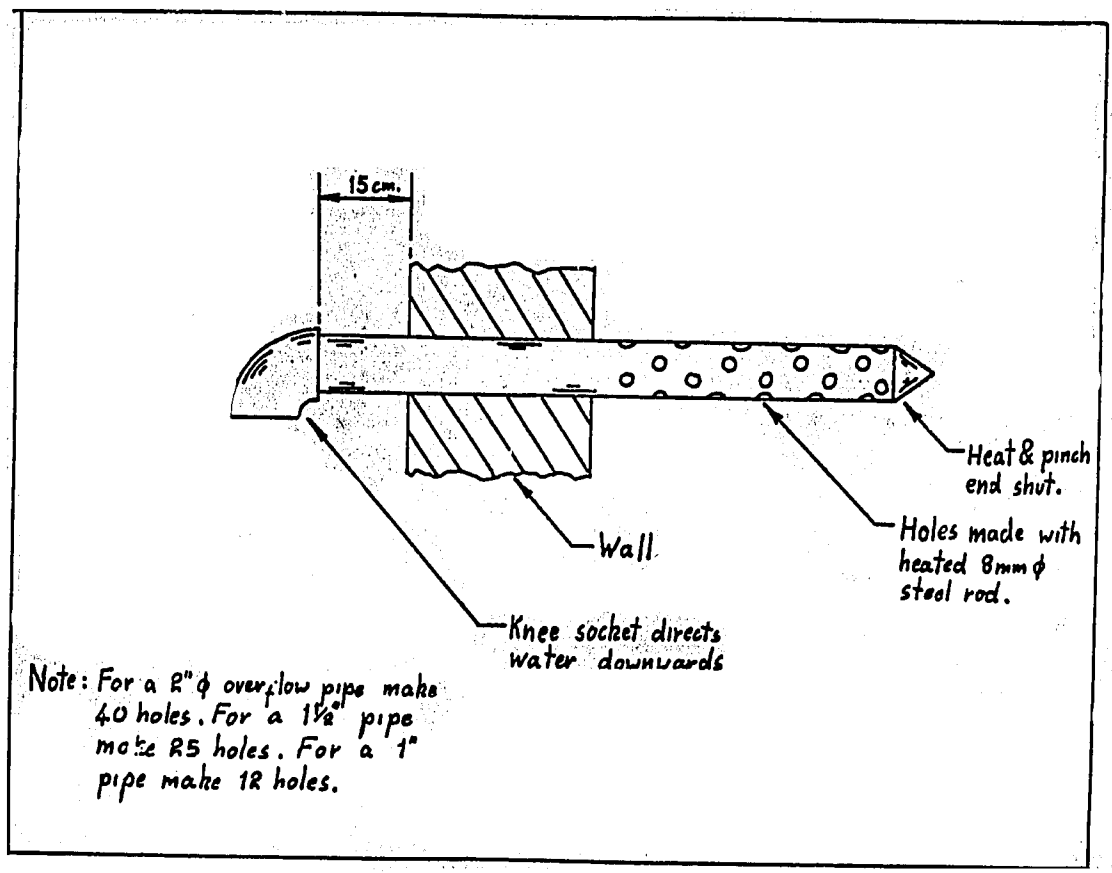
6. It is best to avoid using PVC pipe in concrete walls because there is a tendency to leak. However, the connection between the PVC and steel will present difficulties so a trial should be first made with the PVC to check for leakage.

7. In order to reduce the use of expensive cement, reservoirs and collection chambers need not be plastered on the outside.

8. Always bury PVC pipe.

Figure 2

SCREENED PVC OVERFLOW PIPE



9. Where PVC pipe crosses small gullies a sleeve of galvanized iron pipe can be put over it and firmly anchored or the PVC wrapped in chicken wire and plastered with a 1:3 cement mixture as illustrated in Figure 3. The maximum acceptable span for an iron sleeve would be five meters and for ferrocement three meters.

10. High points should have an air release valve so that the proper flow is maintained. If there is air in the water it will tend to collect at high points and block the flow of water as in Figure 4. Automatic air release valves are very expensive (around $50) so a normal globe or gate valve can be used and manually operated if air blockage is suspected.

11. A cleanout is necessary at all low points in the pipeline. This can be a simple tee closed with a cap.

12. When laying flexible PVC pipe care must be taken to ensure that it is not twisted and pinched while unrolling it.

13. After installation the pipe should be filled with water and the flow stopped. All joints should then be inspected for leakage before burying the pipe.

14. In burying the pipe no stones should be allowed in the first 10 cm of backfill and this should be well compacted before the remaining fill is added. Many of the sharper stones in Irian Jaya could easily puncture the pipe.

15. Tools for construction of source protections and pipe installation as well as later maintenance and repairs should be provided to each comunity or group of communities.

16. Covers for collection chambers and break pressure tanks can be made either of bamboo or steel reinforced concrete. Reinforcement details are included in Appendix D.

17. Break pressure tanks will be necessary at suitable intervals depending on the pressure rating of the pipe in use. A pipe with a rating of 5 kg/cm would require tanks to limit the maximum difference in elevation to 50 meters.

18. Never install the pipe until the trenching for that section is satisfactory. Trenches should be a minimum of 40 cm deep.

3.4 Related Activities

3.4.1 Health Education

The community development project already has some excellent health education activities underway. They can be utilized to facilitate implementation and increase the potential benefits of the water systems.

Figure 3

STREAM CROSSING

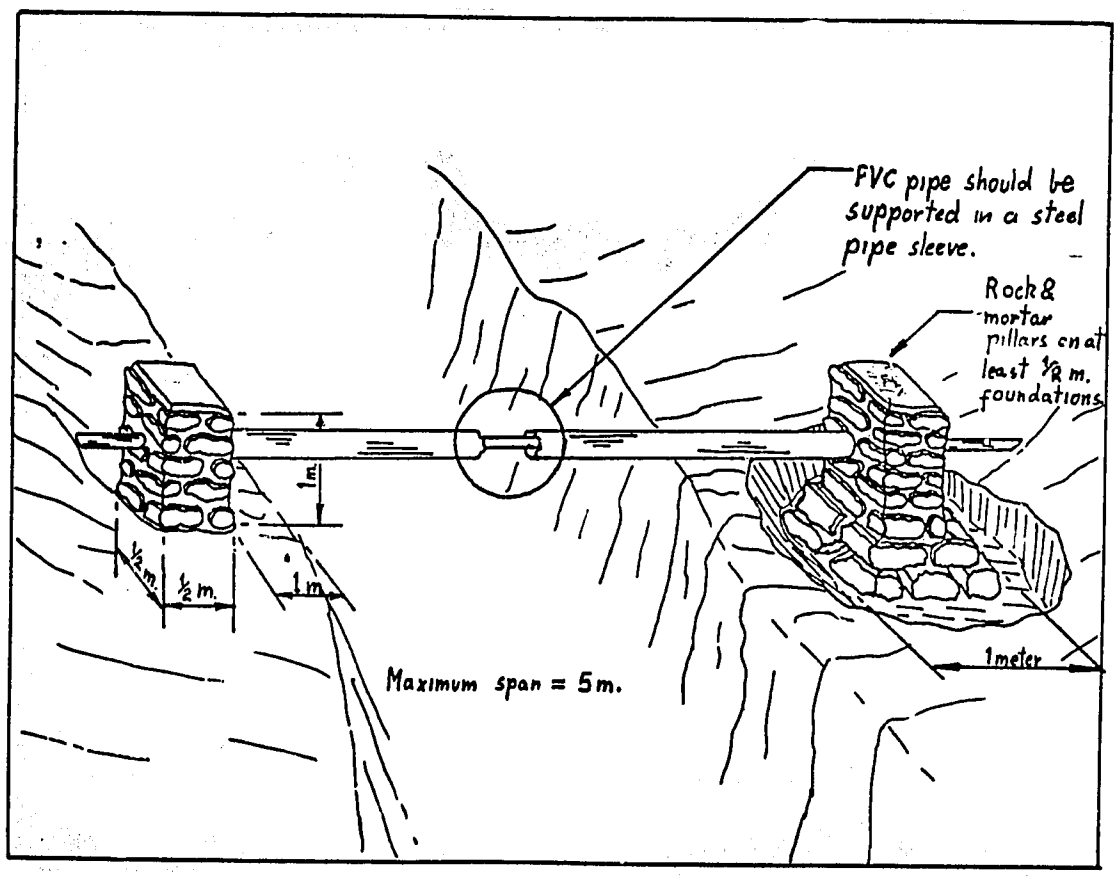
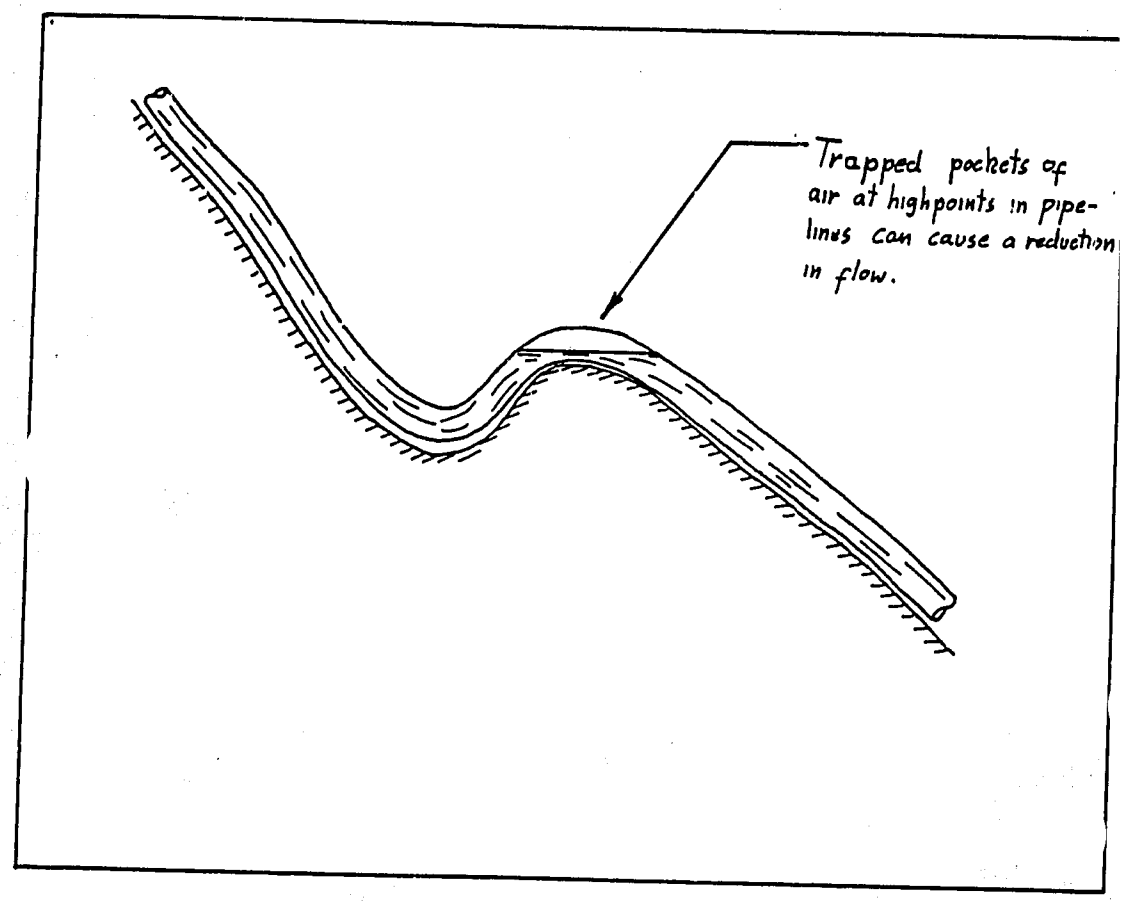


Figure 4

AIR BLOCKAGE IN PIPELINE



3.4.2 Other Water Uses

Several fish ponds have recently been constructed in Minyambou. The use of water for this and improvement of home gardens should be encouraged.

Chapter 4

THE IRIAN JAYA DEVELOPMENT INFORMATION SERVICE CENTER

The Irian Jaya Development Information Service Center was formed approximately two years ago as part of the Asia Foundation's Human Resources Development Project in cooperation with Cendrawasih University. The stated objectives of the center are very broad and it is still in the process of prioritizing activities and establishing working relationships. The following comments are primarily offered to stimulate discussion on the Center's possible role and its relation to water supply. It is not intended to suggest that rural water supply or provision of direct technical assistance should be a main focus of the Center's activities.

- The Center's recently inaugurated bimonthly newsletter can be used to disseminate a wide variety of information useful to others working in Irian Jaya. Chief among these in the area of water supply would be information on possible technical options available for solving water problems, lists of available reference materials, information on periodic publications such as the IRC newsletter, Diarrhea Dialogue, and contact addresses of other active organizations.

- The newsletter can also be used to conduct surveys to collect information or determine needs. For example, how many organizations are actively working on water systems and what is the perceived need for technical resource people. If such information is available it could be used as a basis for decisions on the Center's own role.

- With the existing staff the Center would be able to pass on available literature but it does not have the capacity to respond with specific technical advice. Requests could be referred to an outside organization such as VITA. However, it would be difficult for such an outside organization to adapt its response to the unique situation of Irian Jaya.

- The Center has sponsored two trainees for a six-month course on water supply at Dian Desa in Central Java. One is a villager from the coast near Jayapura and the other an agricultural engineer from the Manokwari Branch of Cendrawasih University. This is a useful step towards establishing a technical resource base within the province. However, it is not certain whether or not the trainees will be able to utilize their new skills. They are not attached to organizations with a specific interest in water supply and they may have other obligations that prevent them from applying their skills. An additional impediment is the lack of resources. They have no funds to implement projects and this may also be true of other organizations which might wish to utilize them. The Center should advertise the presence of the returned trainees and make an effort to locate funding so they can implement projects. Since this is the first such training conducted by Dian Desa the Center should provide feedback to them. The Center should also actively seek out appropriate candidates for future training activities of this nature.

- Given the acknowledged need for technical assistance the Center should consider the merits of employing a water supply resource person to serve all groups in the province. Such a person could actively promote improvements in water supply through improving information services, providing direct technical assistance based on site visits, collecting information, identifying projects worthy of support, training, and constructing simple demonstration water systems. In order to function effectively such a person would need funds for travel and demonstration projects.

- The Center's staff are still debating the desirability and feasibility of directly employing specific technical resource personnel. If providing such assistance is compatible with their goals then they must still decide on which area to concentrate their limited resources. It would not be possible to supply assistance in all disciplines and some needs, such as in agriculture, may be greater than water supply or health. However, in prioritizing it should not be forgotten that water supply activities can be used as an effective tool for community development and an entry point for other activities.

- The Center is also in an advantageous position for identifying small projects worthy of support and recommending them to potential donors. Greater flexibility would be possible if they were provided with a small fund for this purpose.

- In summary, there are many ways in which the Center could extend assistance to water supply programs in Irian Jaya. However, it must plan its activities in the manner most compatible with its objectives, priorities, and limited resources.

Chapter 5

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

1. Official statistics on the number of persons who have reasonable access to safe water in Irian Jaya are not readily available. However, it is almost certainly less than the estimated national average of 16 percent. Few communities now have a reliable source of clean water close to their dwellings and most would benefit significantly from an improved water supply.

2. The greatest potential impact of improved water supplies would be on health due to improvements in personal hygiene. Incidence of skin diseases, dysentery, and infant mortality appear extremely high and could be significantly reduced.

3. Other potentially important impacts would be the introduction of new skills and ideas to the local population, the construction of fish ponds that utilize water from the system, and a reduction in energy needed to procure water. This latter impact is particularly important for women and children in calorie deficient areas in the interior.

4. Improvements in personal hygiene may be difficult to attain because of the lack of soap in all rural areas and low temperatures in mountainous areas. There is also a severe shortage of containers for carrying, boiling, and storing water in rural areas.

5. Water supply problems will become more acute in the future due to a rapidly expanding population. Increased population density means that the likelihood of contamination is higher. It also means that deforestation will be more rapid, and this will tend to decrease the flow of springs.

6. Many of the older systems serving urban areas that were installed during the Dutch period are now inadequate. It is likely that the government will concentrate its limited resources in urban and transmigration areas and will neglect indigenous people in rural areas.

7. There is currently very low awareness of what constitutes "clean water" and the relationship between clean water and health. Health education activities should be implemented in every community receiving an improved water supply.

   This is also true to a certain extent for the government and local organizations which would be willing to use untreated river water as a source. Although this may be acceptable as an intermediate step in the provision of potable water it should be clearly recognized as such.

8. The level of available skills and knowledge is generally very low. Development of the local people and their capabilities must be given attention, particularly in the interior. Skilled masons or plumbers are not available in the interior and it is extremely difficult to find experienced persons from urban areas who will agree to work in the interior.

9. The local population should be involved as much as possible in project implementation in order to improve local skills and because there is definitely no one else to maintain and repair things in most areas.

10. Water systems for the indigenous people should be used as a tool to develop their capabilities and ease their transition into the modern world. They will then be better prepared to deal with the expected influx of migrants from other parts of Indonesia. In the near future, if government plans are fulfilled, there will be more transmigrants than Irianese in Irian Jaya.

11. Irian Jaya covers a wide spectrum of cultures, attitudes and physical conditions, many of which are unique to the area. It is particularly important to avoid preconceived solutions and adapt system designs to the area.

12. Irian Jaya is undergoing profound and rapid changes. What constitutes an appropriate design at the moment may no longer be appropriate in five years' or even one year's time. Any efforts in water supply should begin with a very small number of systems in order to build up the necessary technical knowledge and skills of the local people and so that locally appropriate design parameters can evolve.

13. Designs should be adapted to the Irianese situation. They must be simple and robust. Because of transportation difficulties and high costs, special attention must be given to maximizing the use of local materials.

14. A definite need exists and has been expressed for technical assistance in designing and implementing water systems. However, an institution or practical method of providing such assistance has not yet been identified.

15. There is a general lack of awareness of both the issues involved in rural water supply and the technical options available. The Irian Jaya Development Information Service Center would perform a useful service if it began supplying information on these subjects in its bimonthly newsletter.

16. The World Vision regional training centers may be suitable focal points for demonstration activities and may be able to offer training in masonary skills that would be useful for implementing water activities.

17. The various organizations active in Irian Jaya would benefit greatly from the presence of simple workable demonstration water systems. There are now none available.

18. For most areas in Irian Jaya per capita costs will be relatively high due to the distance from sources of materials, high internal transport costs, and dispersed populations.

19. Many areas have potential for spring fed gravity flow water systems. However, extensive deforestation may significantly reduce the yield of existing springs in the near future.

20. The mountains of Irian Jaya are geologically young and very active. Weathering, slope wash, soil creep, solution, and subsurface erosion are constantly at work and most spring sources can be expected to contain significant amounts of sand. A small collection chamber below the source, to allow for sedimentation, will be required in most cases.

21. Landslides and earth tremors will be problems in mountainous areas, particularly the central highlands. These are hazardous for pipelines and source protections. Protection of the area around the source from agricultural activities is especially important in such cases.

22. Water usage is an unknown factor but it is undoubtedly very low at present. In some areas in the interior it is estimated to be as low as 300 cubic centimeters per person per day. It is not yet known how increased availability and other changes will affect usage. Systems should initially be designed to provide 30 liters per person per day. The pipeline should be designed for four times this amount so that if necessary the addition of storage reservoirs can increase the availability of water in the future. Usage in those systems initially installed should be loosely monitored in order to obtain more accurate information for design purposes.

23. Rolls of flexible PVC pipe are recommended because they can be easily transported on light aircraft and require little skill to install. A potential problem is that all pipe and fittings must be imported from outside Indonesia. Pipe from Australia is relatively expensive. For pipe that has been ordered from Singapore there have been difficulties in obtaining the necessary fittings and the quality of the connecting clamps is poor. Despite this it is not likely that galvanized iron or even rigid PVC would be acceptable due to transport difficulties, higher costs, and the higher level of skills necessary for installation.

24. Many people mentioned problems with the collapsing of dug wells due to unstable soil conditions. Use of cement rings for lining would alleviate this problem and in many areas enable people to reach previously unavailable groundwater by digging deeper than before. At present most areas use oil drums for lining wells and this limits the depth and deteriorates quickly. It would be useful if cement linings were introduced.

25. Handpumps have significant potential for supplying clean water in Irian Jaya. However, people are not yet familiar with handpumps and awareness of the need for maintenance is very low. The condition and quality of wells should first be improved and handpumps introduced gradually at some later time. When handpumps are installed preventive maintenance should be stressed and people given the skills and tools to implement repairs locally.

26. Appropriate handpumps are not locally available. More suitable handpumps (e.g. the Bandung and SB pumps) are manufactured on Java and these should be introduced. However, there is not yet any effective organization or mechanism for doing so. This is actually a problem throughout Indonesia and some government action at the national level would probably be required to improve the situation.

27. In certain areas, both coastal and inland, rainwater catchments are at present the only feasible means of improving the water supply.

28. Improvements in water supply in areas with active missionaries should be relatively easy because those who have responded to the missionaries have demonstrated a willingness to accept change. In many areas missionaries are the only outside change agents active and they will undoubtedly play an important role in organizing the people and implementing projects.

29. Although the missionaries are probably the best vehicle for initiating work in rural water supply, ways of transfering knowledge to government departments and increasing their participation should be actively pursued.

APPENDIX A

WATER AND SANITATION FOR HEALTH (WASH) PROJECT
ORDER OF TECHNICAL DIRECTION (OTD) NUMBER 133
February 7, 1983

FEB 10 1983

TO: Dr. Dennis Warner, P.E.
WASH Contract Project Director

FROM: Victor W.R. Wehman, Jr., P.E., R.S.
AID WASH Project Manager
AID/ST/H/WS

SUBJECT: Provision of Technical Assistance Under WASH Project Scope of Work for USAID/Indonesia and Care/Indonesia

REFERENCE:
A) Jakarta 18964, 22 Dec 82
B) Jakarta 18849, 20 Dec 82
C) STATE 2017, 5 Jan 83
D) Isely Memo, dated 2/4/83
E) Jakarta 00221, 6 Jan 83
F) Jakarta 01433, 27 Jan 83
G) WASH Telex No. 532, 4 FEb 83
H) WASH Telex No. 505, 14 Jan 83

1. WASH contractor requested to provide technical assistance to USAID/Jakarta and Care/Jakarta as per reference D, para. 2, 3, as follows:

(a) to assist USAID/Jakarta Mission in developing a feasibility assessment and plan for a PVO/OPG project involving 70 - 80 small scale water systems in Minyambou area with the World Relief Corporation, and,
(b) to assist the Development Information Service (a PVO) in planning a water supply and sanitation project in the Jaya Pauva area.

2. WASH contractor/subcontractor/consultants authorized to expend up to 40 person days of effort over a four (4) month period to accomplish this technical assistance effort.

3. Contractor authorized up to 31 person days of international and/or domestic per diem to accomplish this effort.

4. Contractor to coordinate with ASIA/TR/HN, USAID/Jakarta and AID/W Indonesia Desk Officer and should provide copies of OTD #133 along with periodic progress reports as requested by S&T/HEA or ASIA Bureau.

5. Contractor authorized to provide up to zero (0) international round trips from consultant's home base through Washington, D.C. to Jakarta, Indonesia and return to home base through Washington, D.C. during life of OTD.

6. Contractor authorized to provide up to four domestic internal Indonesian round trips from Jakarta to Minyambou Iran Java, Jaya Pauva as required.

7. Contractor authorized to obtain secretarial, graphics or reproduction services in Indonesia as necessary to accomplish tasks. These services are in addition to the level of effort specified in paragraph 2 and 3 above and NTE $600 without prior approval of AID WASH Project Manager.

8. Contractor authorized to provide for car, vehicle(s) or small aircraft rental if necessary to facilitate effort. Mission is encouraged to provide Mission vehicles, if available. Effort NTE $2600 without prior written approval of AID WASH Project Manager.

9. WASH contractor will adhere to normal established administrative and financial controls as established for WASH mechanism in WASH contract.

10. WASH contractor should definitely be prepared to administratively or technically backstop field consultants and subcontractors as required to carry out this task.

11. Contractor report on overall progress of activity is to be made in writing . A coordinated draft report should be left with USAID/Indonesia upon return of consultant to Jakarta. USAID/Indonesia is encouraged to provide secretarial support, if available, to consultant for typing of draft report. Final report is due to USAID/Indonesia, S&T/H/WS and WASH within 30 days after consultant turns in coordinated draft report to USAID/PVO Officer. WASH consultants coordinated draft report to be air pouched by USAID/Jakarta to S&T/H/WS (V. Wehman) and concurrently airmailed by WASH consultant to WASH Project Director (see address on brochure).

12. New procedures regarding subcontractor cost estimates and justification for selection of consultants remains in effect.

13. Mission should be contacted immediately and technical assistance initiated.

14. Appreciate your prompt attention to this matter. Good luck!

ACTION COPY

UNCLASSIFIED

Department of State

INCOMING TELEGRAM

WASH Dir. Sec.

REF A

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TO SECSTATE WASHDC 7963

UNCLAS JAKARTA 18964

C O R R E C T E D C O P Y (TEXT: PARA III)

AIDAC

FOR CARL MCJUNKIN

EO 12356: N/A

SUBJECT: EVALUATION CARE INDONESIA RURAL WATER SUPPLY PROJECT

1. HAVE AGREED WITH ELLIS FRANKLIN, DIRECTOR OF CARE/INDONESIA AS TO UTILITY OF AN EVALUATION OF CARE'S RURAL WATER PROJECT. SINCE 1980 CARE HAS CONSTRUCTED 70 SMALL SCALE RURAL WATER SYSTEMS COMPRISING 500 WELLS AND NUMEROUS GRAVITY FLOW SYSTEMS IN OVER 100 VILLAGES SPREAD OVER THREE PROVINCES AT A COST OF ABOUT DOLS. 2.5 MILLION. SIMILAR ACTIVITIES ARE IN APPROVAL PROCESS FOR AID FINANCING FOR THE NEXT YEAR, BUT DIRECTION OF PROGRAM UNCERTAIN THEREAFTER. AN EVALUATION OF ACCOMPLISHMENTS TO DATE WOULD HELP ESTABLISH WHAT MAKES SENSE FOR THE FUTURE.

2. MISSION WOULD LIKE TO DRAW UPON WASH SERVICES TO ASSIST CARE TO DEVELOP A SCOPE OF WORK FOR THE EVALUATION. MISSION CURRENTLY ENVISIONS THE MAIN PURPOSES OF THE EVALUATION TO BE TWO FOLD. ON THE ONE HAND THE MISSION AND CARE WOULD LIKE TO ASSESS THE COST EFFECTIVENESS AND IMPACT OF COMPLETED WORKS. SECONDLY THE MISSION WOULD LIKE TO ASSIST CARE TO CONSIDER A STRATEGY FOR LEVERAGING THEIR RESOURCES TO IMPACT ON GOVERNMENT WATER PROGRAMS.

3. MISSION ESTIMATES THAT THE SCOPE OF WORK COULD BE DEVELOPED IN 10-15 MAN DAYS. THIS SOULD ALLOW EVALUATION CONSULTANT TIME TO REVIEW THE CARE PROGRAM, VISIT SITES AND MEET WITH CONCERNED PARTIES. THE MISSION WOULD HOPE THAT SERVICES OF A CONSULTANT LIKE BOB GEARHEARDT, WITH PRIOR INDONESIAN EXPERIENCE, WOULD BE AVAILABLE IN JANUARY OR EARLY FEBRUARY. THE MISSION WOULD HOPE THAT THE EVALUATION COULD BE CARRIED OUT IN MARCH OR APRIL OF 83. CARE HAS ALREADY DONE CONSIDERABLE PREPARATORY WORK ON A PROTOTYPE OF A SCOPE.

4. PLEASE ADVISE ON AVAILABILITY OF WASH SERVICES FOR THIS JOB. MONJO

Copy to WASH Director 12.27.82

Received STH/WS (Wehman) 1-5-83
Passed to WASH 1-6-83

APPENDIX B

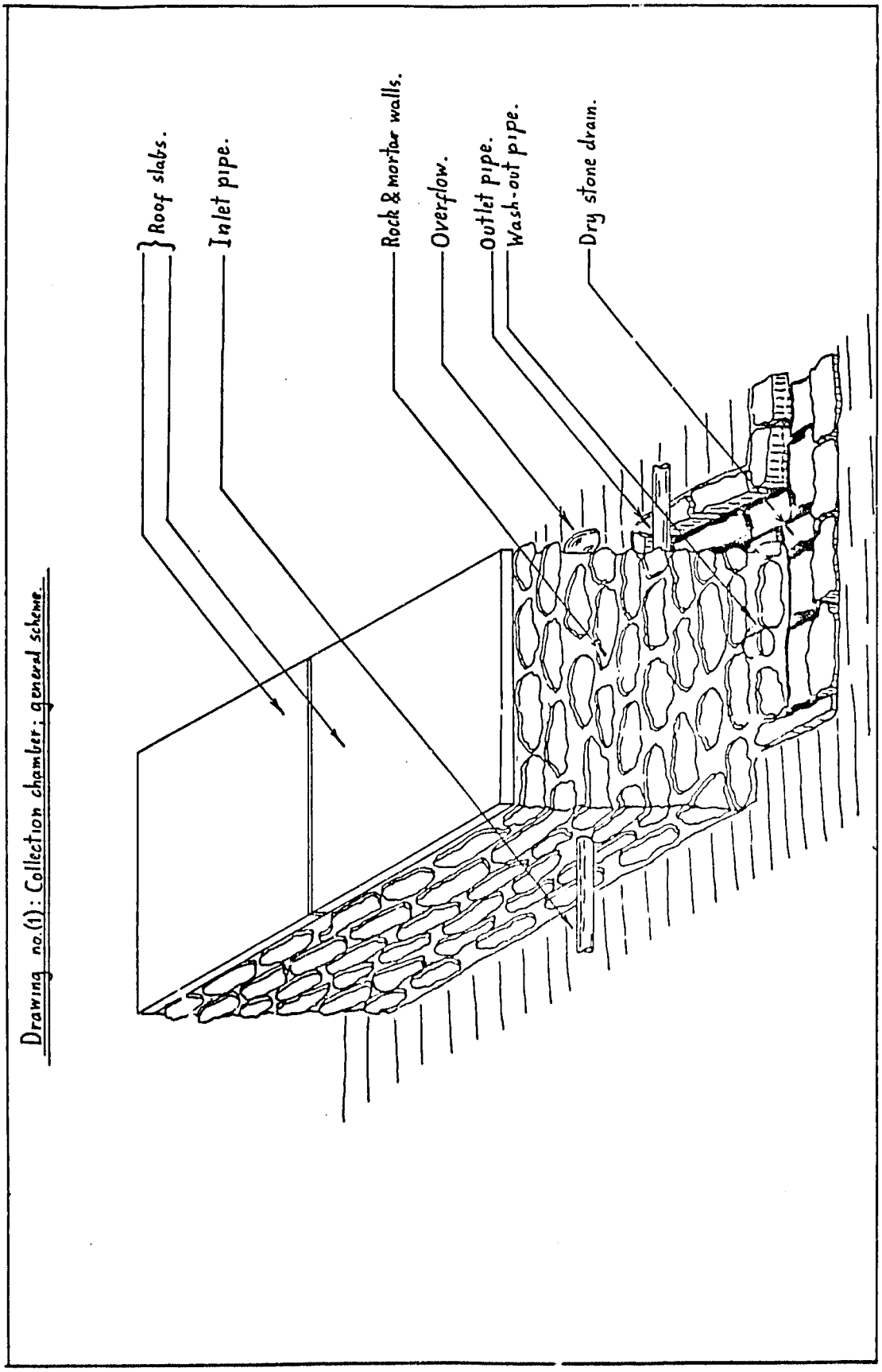
Itinerary

10 April	Travel to Denpasar
11 April	Travel to Biak
12 April	Travel to Manokwari
13-20 April	Work and Travel in Minyambou area
21 April	Manokwari site visits
22 April	Travel to Jayapura
23-26 April	Activities in Jayapura area, site visits to Engros and Tobati
27 April	Travel to Denpasar
28 April	Travel to Lombok

APPENDIX C

Persons Contacted

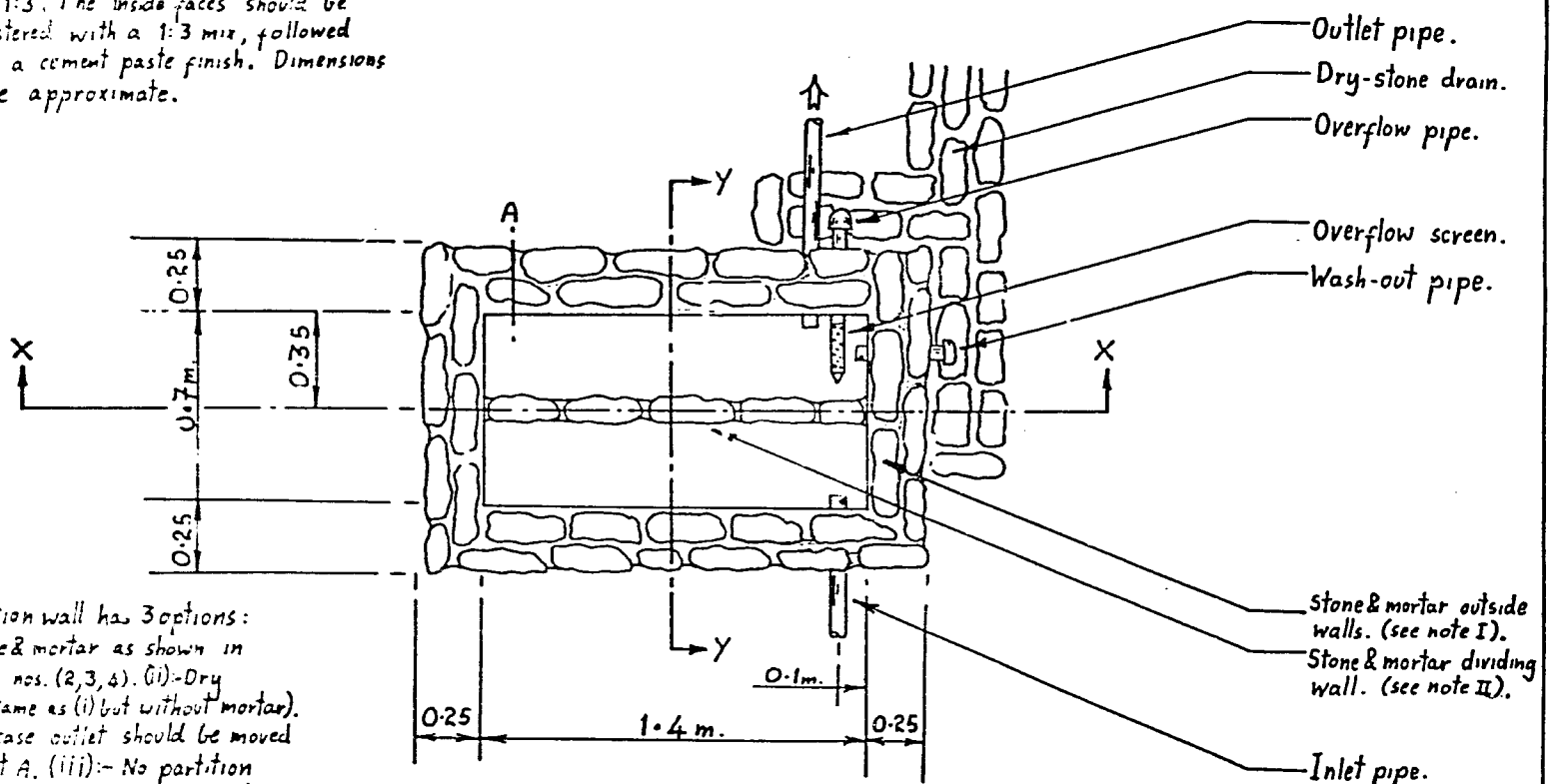
Larry Rasher	TEAM - Biak
Mike Hannas	Geraja Protestan Indonesia
Chuck Preston	TEAM Manokwari
Bob Lenz	TEAM Manokwari
Doug Miller	TEAM Minyambou
Julie Miller	TEAM Minyambou
Mahidin Y. Syarif	Minyambou Community Development Project
P. Siahaan	Kep. Sub Seksi Hygiene dan Sanitasi Kabupatan Manokwari
George Aditjondro	Director IJ-DISC Abepura
John Strand	Coordinator IJ-DISC Abepura
Jean Eng	Health Advisor IJ-DISC Abepura
Ron Petocz	World Wildlife Fund Jayapura
Dr. Budi Subianto	UNCEN Pimpinan Program Perawatan Kesehatan
Dr. Hariandja	Kepala P3M Propinsi Irian Jaya
Dr. Iswandi	Kepala Dinas Kesehatan Irian Jaya
Eddy Susanto	The Mission Fellowship Jayapura
Karl Maniani	District Superintendent KINGMI
Larry Vaughn	Christian Missionary Alliance Abepura
Christine Ryeman	Christian Missionary Alliance-Tiom
Tony Rahawaren	Delegate Social. Catholic Church
Dr. Tumangkan Gerunger	Ketua Yayasan Gakonia G.K.I.
Yonias Taedini	World Vision Jayapura
Agus Rumansara	Direktor Puspenda Sentani



Drawing no.(1): Collection chamber; general scheme.

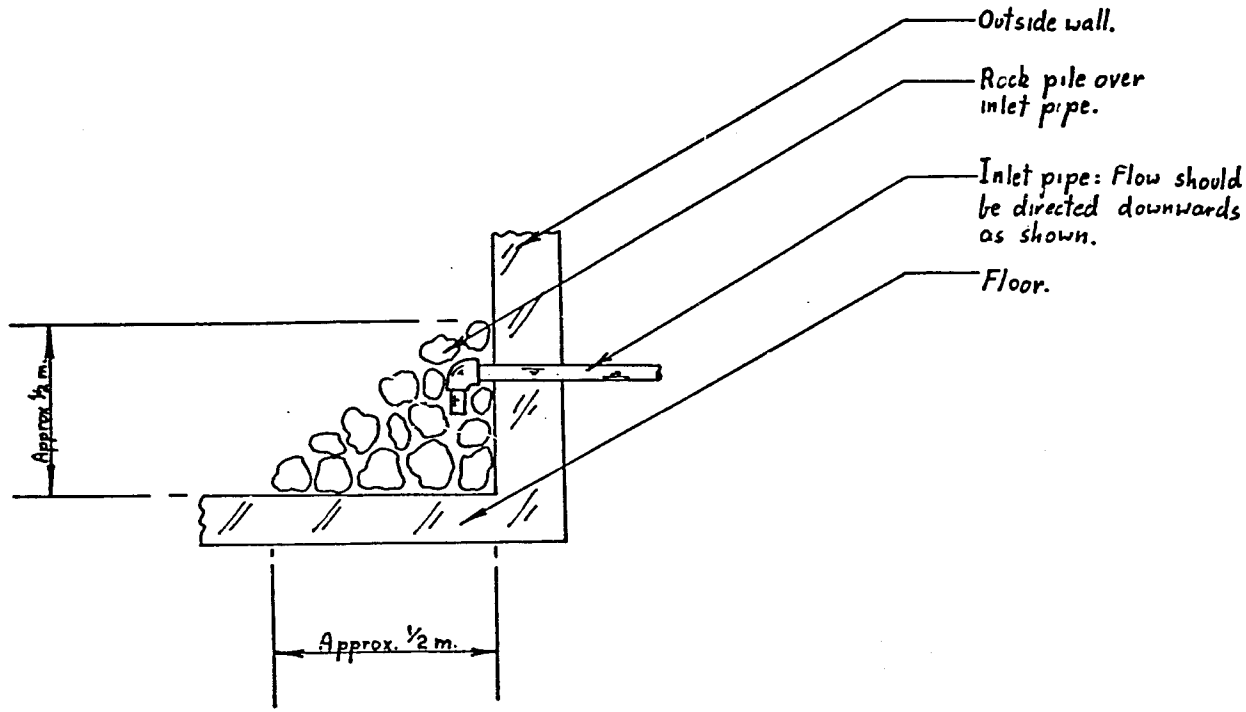
Drawing no. (2): Collection chamber; plan view.

Note I: Outside walls should use mortar mix of 1:3. The inside faces should be plastered with a 1:3 mix, followed by a cement paste finish. Dimensions are approximate.

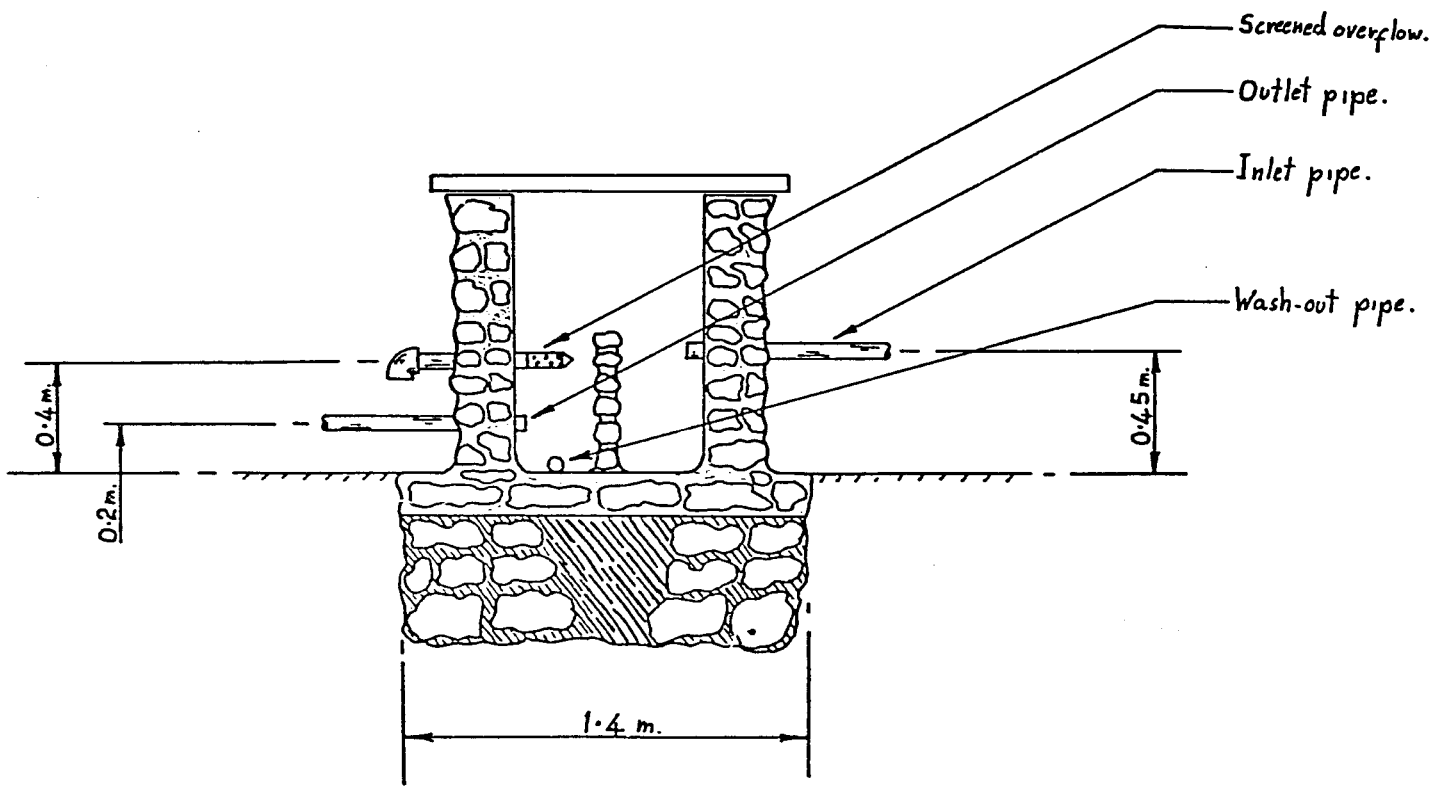


Note II: Partition wall has 3 options:
(i):- Stone & mortar as shown in drawings nos. (2,3,4). (ii):- Dry stone, (same as (i) but without mortar). In this case outlet should be moved to point A. (iii):- No partition wall as such; use rocks piled up over inlet pipe, see drawing (2a). In this case, outlet should be moved to point A.

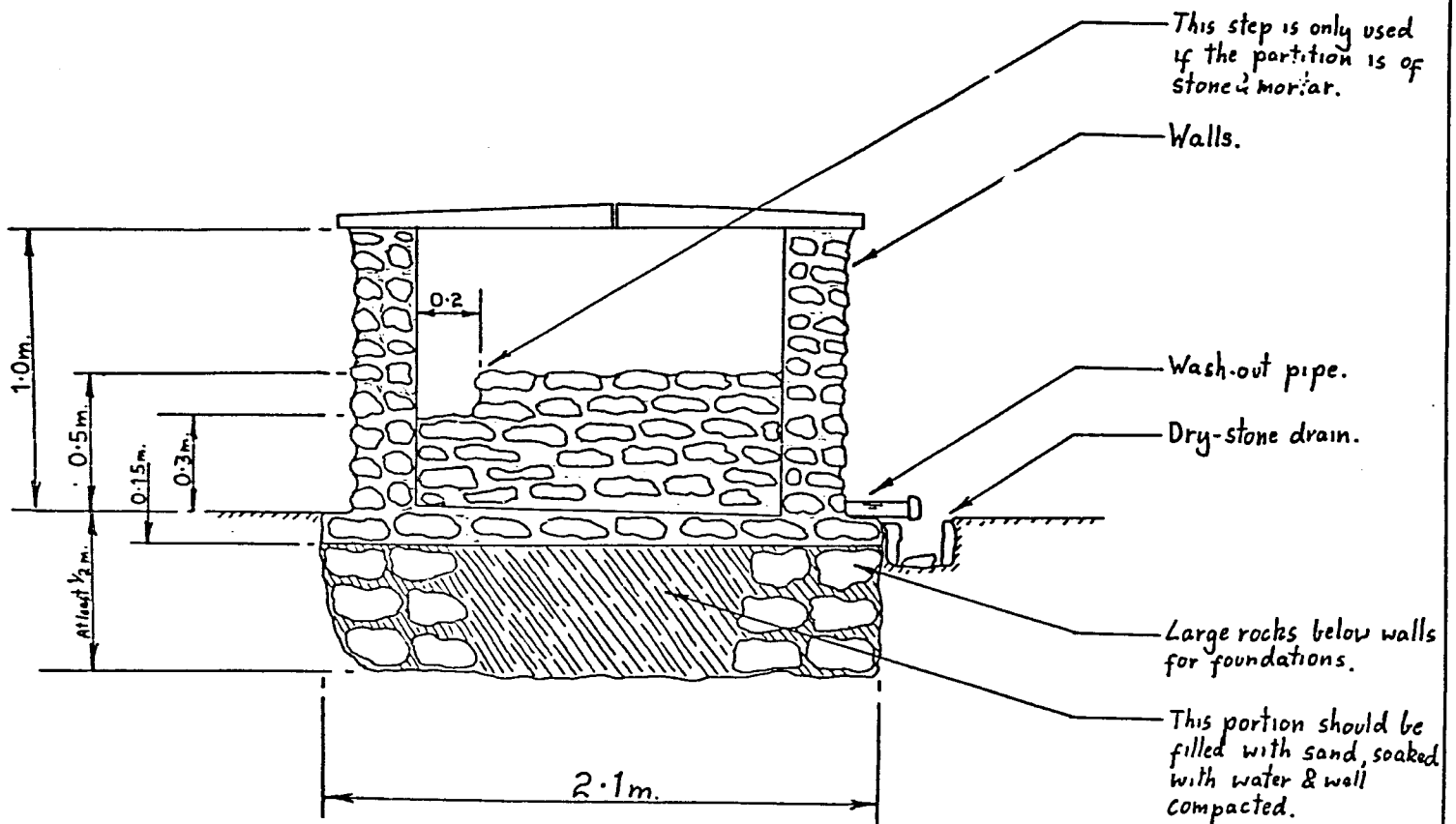
Drawing no.(2a): Collection chamber; Alternative to partition wall.



Drawing no.(3): Collection chamber; end view, section on Y-Y.

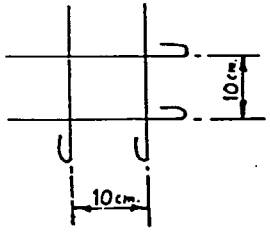


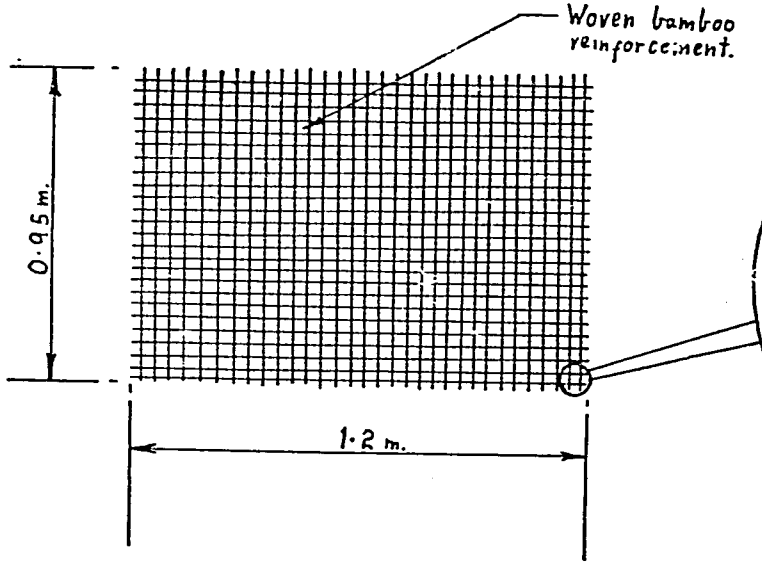
Drawing no.(4): Collection chamber; Side view, section on X-X.



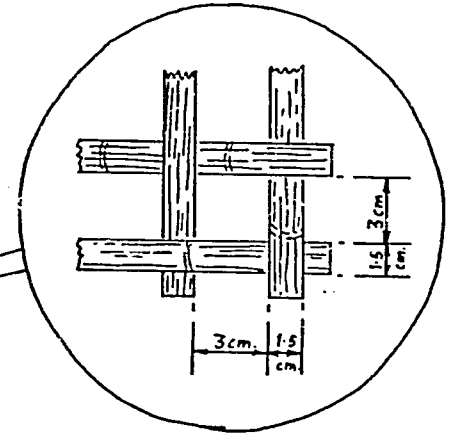
Drawing no.(5): Collection chamber; Construction details for roof slabs.

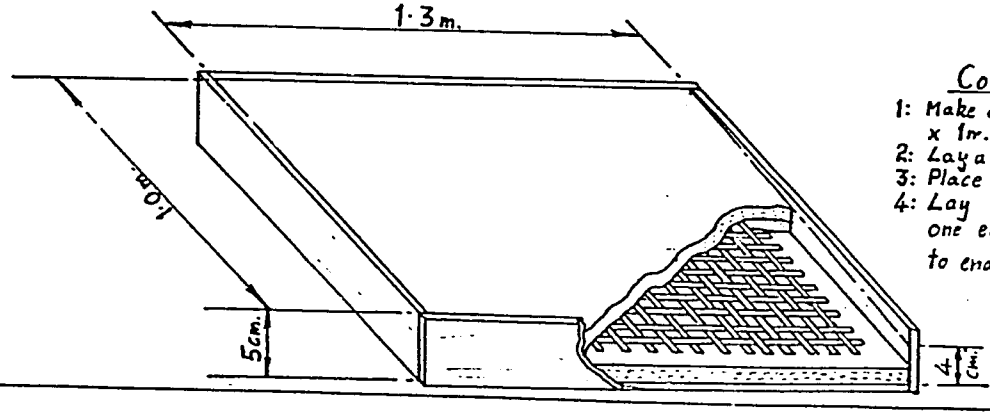
If bamboo reinforcement is unsuitable; use 8mm ϕ steel reinforcement as below.





Detail of bamboo weave.





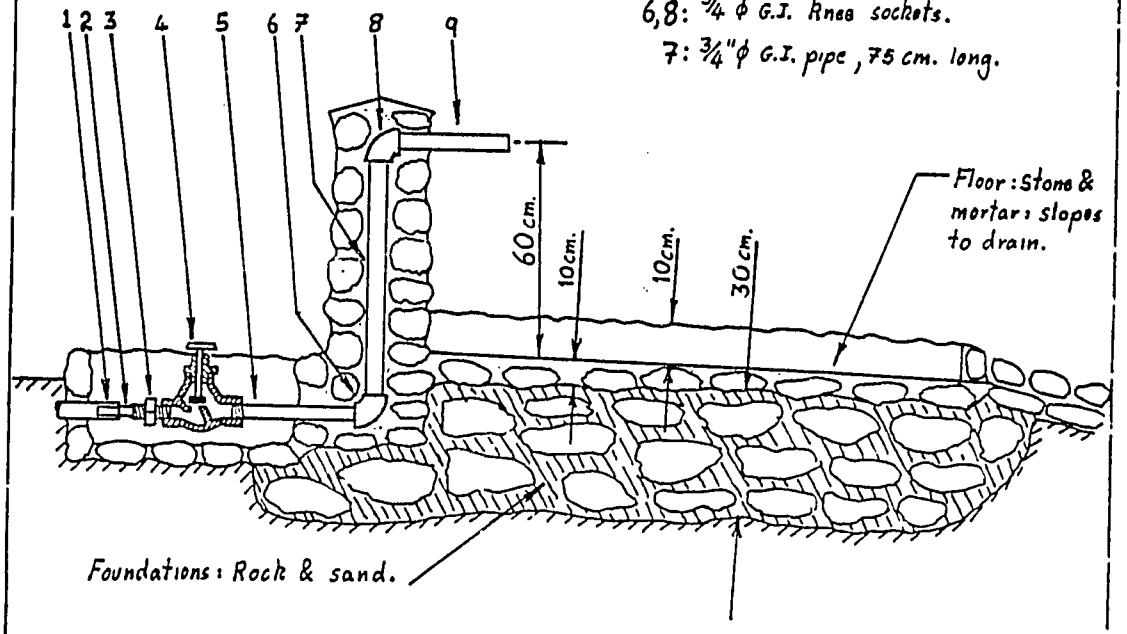
Constructing the slabs.

1: Make a wooden box with inside dimensions: 1·3 m. x 1m. x 5cm.
2: Lay a 2 cm. thick layer of plaster; 1:3 cement: sand mix.
3: Place the bamboo mat on top of this plaster.
4: Lay more plaster until the box is full, but make one edge lower (as shown by dotted line), this is to enable drainage.
5: Keep the plaster & box continuously wet for at least one week to enable curing.

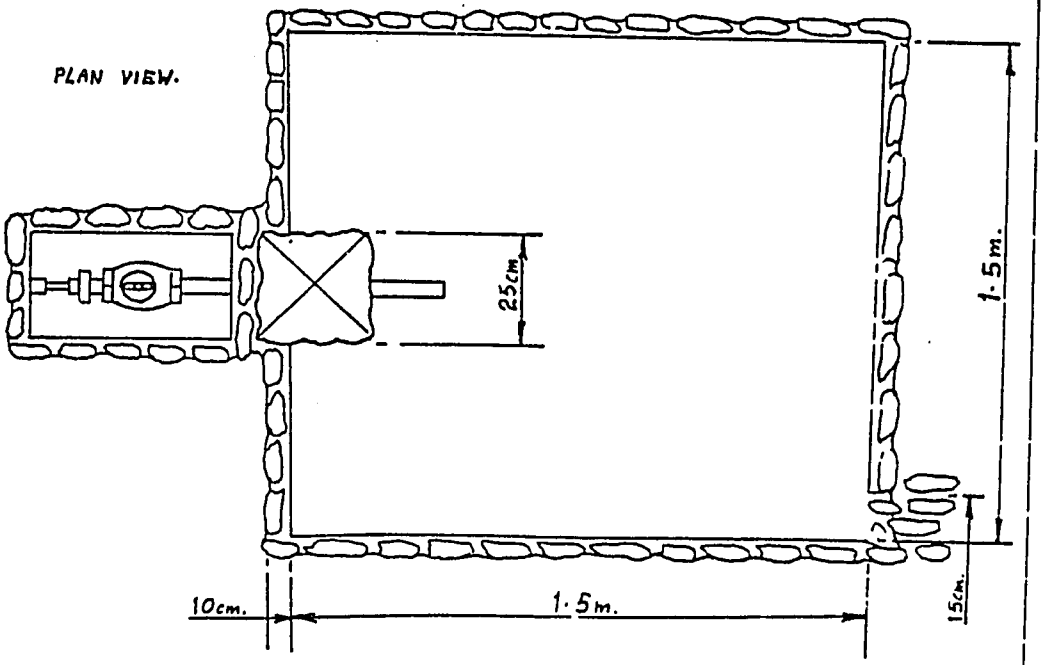
Drawing no.(6): Standpipe.

1: 3/4"ϕ PVC pipeline.
2: Standard pipe connector welded to part no. 3.
3: 3/4"ϕ G.I. double nipple.
4: 3/4"ϕ globe valve.
5,9: 3/4"ϕ G.I. pipe, 25 cm long.
6,8: 3/4"ϕ G.I. knee sockets.
7: 3/4"ϕ G.I. pipe, 75 cm. long.

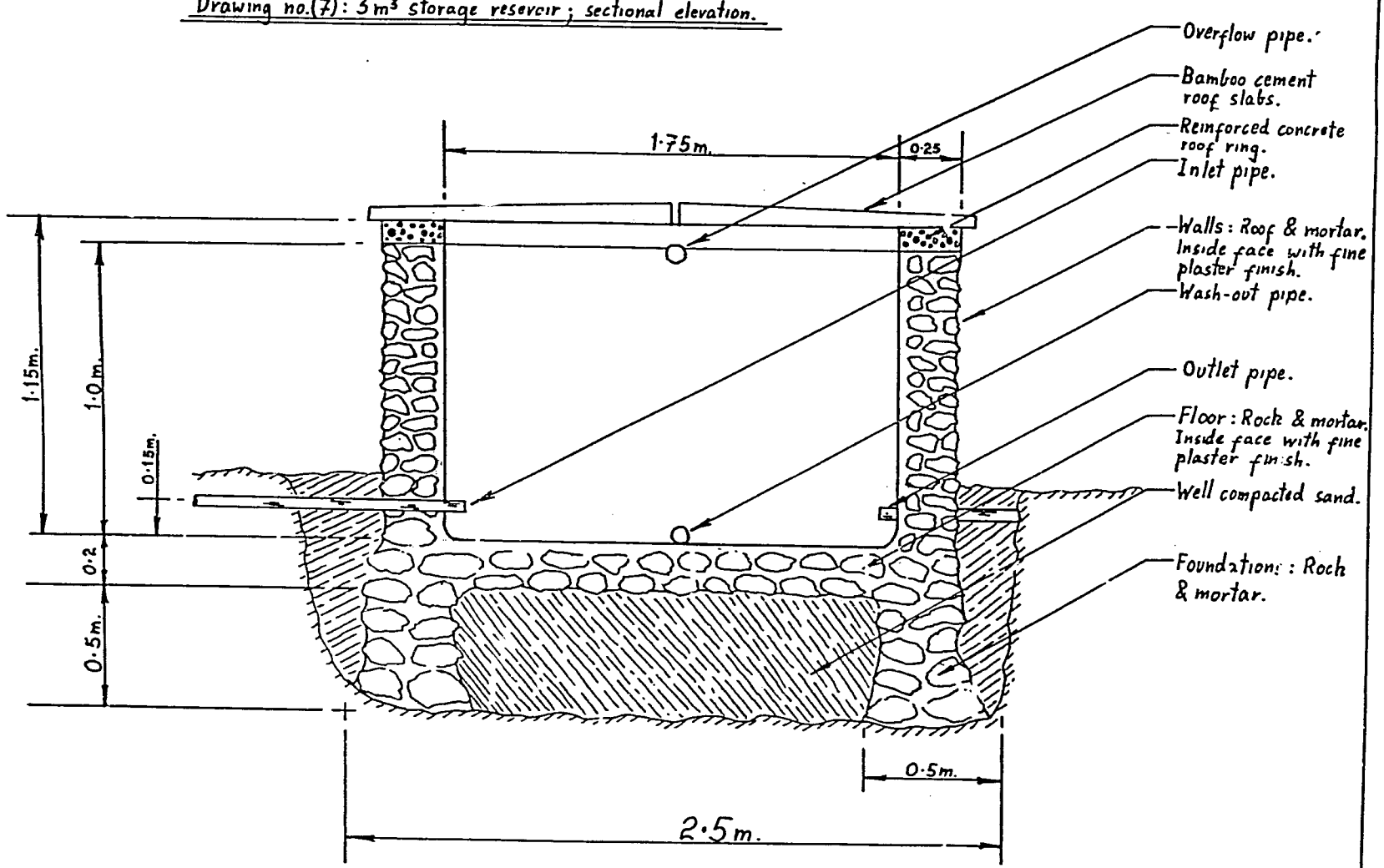
SECTIONAL ELEVATION.



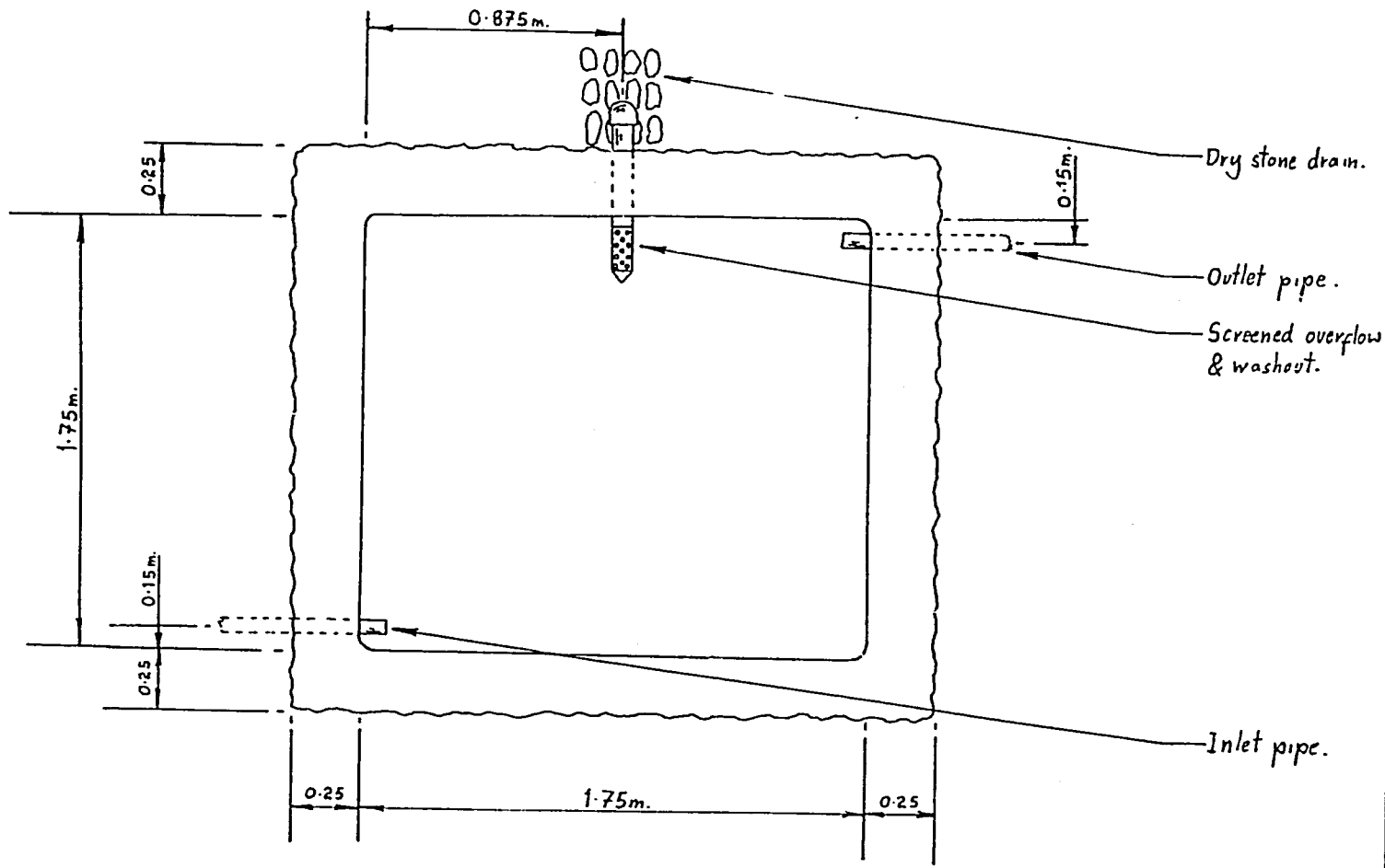
PLAN VIEW.



Drawing no.(7): 3 m³ storage reservoir; sectional elevation.



Drawing no. (8): Storage reservoir; plan view without roof.



APPENDIX E

REFERENCE MATERIALS SUPPLIED TO TEAM AND IJDISC

1. "Gravity Flow Water Systems. Practical Design Notes for simple Rural Water Syatems" A. Scott Faiia 1982 (both Indonesian and English versions).

2. "Design Problems for Simple Rural Water Systems" A. Scott Faiia 1982 (both Indonesian and English versions).

3. "Small Water Supplies". Cairncross and Feacham 1978, Ross Institute Bulletin No. 10

4. List of basic reference books for rural water supply.

5. Design notes on the following topics:
   a. Topographic Surveying 12pp. English
   b. Concrete and Masonry 20pp. English
   c. Check list for Spring Protection
   d. Standard Design for Break Pressure Tank (5 drawings)
   e. Surveying with a Homemade Surveying Level 6pp. English
   f. Health Education 6pp. Indonesian
   g. Pipe Installation 4pp. Indonesian
   h. Standard design of 6M3 Reservoir 11pp. Indonesian
   i. Calculation of Population Growth 1p. Indonesian
   j. Gate Valve and Globe Valve usage 1p. Indonesian
   k. Pipe Selection Charts 2pp.
   l. Conversion Factors 1p.