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Appendix 6A, Ch 6
Page 4 (TM 3:1)

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE ("X" appropriate box)
[X] Original [ ] Change [ ] Add [ ] Delete

PP

DOCUMENT CODE 3

2. COUNTRY/ENTITY

3. DOCUMENT REVISION NUMBER

4. PROJECT NUMBER

5. BUREAU
a. Symbol: TAB
b. Code: 6

6. ESTIMATED FY OF PROJECT COMPLETION
FY 78

7. PROJECT TITLE - SHORT (stay within brackets)
Utilization-Evaluation AID Hand Pump

8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION
a. INITIAL mo. yr. 2 76 b. FINAL FY 76

38 p.

9. ESTIMATED TOTAL COST ($000 or equivalent, $1 =)

a. FUNDING SOURCE	FIRST YEAR FY 76 b. FX	c. L/C	d. Total	ALL YEARS e. FX	f. L/C	g. Total
AID APPROPRIATED TOTAL	126					126
(Grant)	( )	( )	( )	( )	( )	( )
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
HOST GOVERNMENT						
OTHER DONOR(S)						
TOTALS						

10. ESTIMATED COSTS AID APPROPRIATED FUNDS ($000)

a. Appropriation (Alpha Code)	b. Primary Purpose Code	c. Primary Tech. Code	FY 76 d. Grant	e. Loan	FY 77 f. Grant	g. Loan	FY 78 h. Grant	i. Loan	ALL YEARS j. Grant	k. Loan
PH			126						126	
TOTALS			126							
11. ESTIMATED EXPENDITURES			80		33		13			

12. PROJECT PURPOSE(S) (stay within brackets) [ ] Check if different from PID/PRP

1. Evaluate accomplishments of a previous AID research contract.
2. Further develop a shallow or deep well hand pump, capable of local production that will gain broad acceptance and usage, reduce maintenance problems and contribute to the success of safe water supply programs in LDCs.
3. Promote utilization of information gathered through previous research contract.

13. WERE CHANGES MADE IN BLOCKS 12, 13, 14, or 15 OF THE PID FACESHEET? IF YES, ATTACH CHANGED PID FACESHEET.
[ ] Yes [X] No

14. ORIGINATING OFFICE CLEARANCE

Signature: Edward D. Irons, M.D.
Title: Deputy Director, Office of Health, A.I.D.
Date Signed: mo. 12 day 11 yr. 75

15. Date Received in AID/W, or For AID/W Documents, Date of Distribution: mo. day yr.

AID 1330-4 (7-75)

✓ No log frame.
✓ See N. Ashley comments

approved with recommendation by Bureaus to expand project, which had been curtailed due to cut in TA budget
AS 3-30-76

PROJECT PAPER

Utilization and Evaluation of AID Hand Pump Operated Under Village Conditions

Short Title: Utilization-Evaluation Aid Hand Pump

Part I - Summary and Recommendations:

A. Face Sheet Data.

See accompanying face sheet.

B. Recommendations

1. Grant FY 76 $126,000

2. Waiver of source and origin for procurement of commodities.

C. Description of Project.

Project will undertake the field testing of the AID hand pump under village conditions in two countries of Africa to evaluate their performance against other pumps in use in the test countries; their performance against AID pump design criteria and the feasibility of their manufacture locally. The project will be managed by the Economic Development Laboratory of the Engineering Experiment Station at the Georgia Institute of Technology utilizing the developing country network of counterpart organizations generated by Georgia Tech under prior AID funding. Funds allocated to the project will permit the evaluation of:

1. The performance and acceptability of the AID pump against other pumps used in developing countries;

2. The feasibility of local manufacture of the AID pump;

3. Material utilization options such as the use of PVC and/or epoxy.

The long-term purpose or objective in the development of a hand-operated pump, capable of local production, for shallow and deep wells, of optimal design and performance that will gain broad acceptance and usage, reduce maintenance problems and contribute significantly to the success of safe water supply programs in developing countries.

D. Summary Findings

The AID pump designed under a series of AID research contracts has not been tested under the severe conditions to which it would be subjected in routine use in developing countries. To test the pump and gain local acceptance it must be shown to be equal or superior to pumps otherwise available. The comparative, face-to-face testing proposed herein is the most suitable procedure to meet the problem.

No adverse environmental impact is anticipated. Sustained large scale production of the pump without improvement in foundry practices could conceivably increase air pollution. However, pumps produced in a cupola foundry in the quantities envisaged herein (less than 50 pumps) will produce no discernable pollution.

The project meets all known applicable statutory criteria.

E. Project issues

None.

Part II - Project Background and Detailed Description

A. Background

A survey, conducted by WHO in 91 selected developing countries, indicated that only 29% of the total population had access to safe drinking water at the end of 1970. In rural areas, more than 85% of the population did not have safe drinking water available to them. It is estimated that each year 500 million people are affected by water-borne and water-associated diseases and as many as 10 million die, about half of them infants.

Water is a major vehicle for the direct transmission of cholera, diarrhea and enteritis, infectious hepatitis, typhoid and paratyphoid fever, amoebic and bacillary dysentery and schistosomiasis. The lack of adequate safe water is a major contributor to the lack of basic sanitation. Poor personal hygiene and household practices associated with the lack of adequate safe water relate directly to the transmission of diarrheal disorders and the spread of skin diseases, external parasites, trachoma, typhus and trichomoniasm, among others. Poor environmental sanitation exemplified by poor water supplies, enteric diseases and malnutrition constitute a mutually reinforcing and deadly trilogy of disease and sickness common in the developing world, taking the heaviest toll among infants and children.

Lack of basic sanitation, which to a large measure is determined by lack of an adequate safe water supply, is part of the common condition and quality of life of 40% of the peoples of the developing countries--

approximately 800 million human beings, most of whom live in rural areas. They live in what has come to be called absolute poverty, a condition of life that Robert McNamara has described as ". . . so degraded by disease, illiteracy, malnutrition and squalor as to deny its victims basic human necessities." They constitute the "poor majority" to which donor governments and multi-national organizations are now directing their attention as a critical focus in the socio-economic development process of developing countries.

Under these conditions the presence of safe potable water is frequently a sick or well, life or death matter and the hand pump may be the most important single piece of equipment in the lives of the people concerned. Its successful installation and operation is the king-pin of efforts to improve and operate rural community water supply systems in thousands of villages in developing countries. The major problem that hand pumps present in developing countries is poor maintenance that results from the lack of skills and spare parts. Added to this is the extraordinary stress and heavy usage to which pumps are subjected; it is not uncommon for a single pump to serve several hundred people plus livestock. Despite the needs, it was stated as recently as November, 1973, in Technology Assessment and Research Priorities for Water Supply and Sanitation in Developing Countries, International Development Research Center, Ottawa, that while there has been some progress, the world still does not have a hard-wearing, long-lasting, easily repaired, locally manufactured hand pump.

There exists a wide range of pumps and lifting devices designed to suit varying water source conditions and levels of need. Some are the result of development assistance efforts concerned with the increasing need for

water supply systems, or improved systems, in developing countries. However, there has been no adequate evaluation and assessment of such technology.

The Battelle Memorial Institute, under AID contracts that began in January 1966, has designed and laboratory tested a reciprocating shallow and deep well hand pump for use in developing countries, which is referred to in this proposal as the AID pump. Starting with the premise that successful water programs must take into account and be implemented within the conditions and capabilities of the countries in which they are to take place, the pump was originally designed to meet the following criteria: 1) low cost of production; 2) long life under severe conditions; 3) easily operated by small people (women and children):4) suitable for both shallow and deep well application; 5) capable of being manufactured in developing countries; 6) easily and simply maintained and 7) designed to minimize pilferage and vandalism.

Limited field evaluation of the pump was conducted by Battelle in Thailand where a form of the pump was manufactured on a small scale but utilizing only one feature of the AID pump design; in Nigeria where approximately 80 pumps have been manufactured involving various modifications; in Bangladesh where there are preparations to produce 30,000 to 60,000 pumps, mostly shallow well; and later in India and Tanzania where results of field testing have not yet been obtained.

As a result of this experience, a number of variations in the basic AID shallow and deep well designs have evolved, new material utilization alternatives continue to emerge for consideration, reduction in manufacturing costs resulted from the experience in Nigeria, and improvements in durability have been derived. However, the pumps, various

design innovations and material improvements have not been tested under the severe conditions to which they would normally be subject under routine use in developing countries. Moreover, the limited field test program conducted to date appears to indicate an almost total absence of consensus among governments, producers and concerned agencies on the optimum pump for universal use in developing countries.

There is little field test data to support the varying views of any of the involved parties on even basic features of pump design and material specifications, or to answer basic questions concerning the comparison of the AID style pump vs. other pump types currently in use in developing countries. Without answers to such questions and without proper testing of various alternatives under actual field use conditions, it is not possible to make unqualified selection of pump types and modifications based on objective data and demonstration. At present, decisions to produce any one type or modification in significant numbers would be determined by local preferences and existing capabilities rather than proven optimum design.

These unanswered questions and lack of scientific or even quasi-scientific testing under actual field use conditions of various alternatives make an unqualified choice of type and modifications for any particular country almost impossible at this stage. Plans for production of any significant number of any one type are now based on local preferences or capabilities rather than on a proven optimum design. This situation can only be corrected by a systematic, well controlled field evaluation of the more promising alternatives and modifications known.

The evaluation would have multiple objectives:

a. Seek to identify the most acceptable, dependable, and most easily maintained hand pump available today.

b. Promote utilization of significant results of prior AID research.

c. Provide for an analysis of the recently completed AID design project which might be used as a basis for further improvement of design.

d. Offer substantial possibilities to the solution of a development problem, i.e., to the alleviation of bacterial pollution which causes unnecessary infant mortality.

A corollary objective is, through the local manufacture of hand pumps, to promote the development of small industry and technology in developing countries.

The project proposed hereunder differs in scope, but not in objective, from that originally proposed by TA/H. The prior project envisaged pump manufacture in one country in Asia, one in Africa and one in Latin America. Comparative testing of pumps installed in three Asian countries, three African and three Latin American would have been undertaken. The number of pumps installed in each would collectively have constituted a sample of sufficient size to insure that a small number of defects observed would still be a statistically significant figure. The cost would have been about $400,000. The following project represents a TAB decision to cut the costs of the project by some 70%. For this amount of money pumps can be manufactured at a single site and tested in two countries only. The parameters of that project are discussed below.

B. Detailed description

To accomplish the objective outlined above the project will undertake field testing of the AID hand pump under village conditions in two countries in Africa to evaluate their performance against other pump types in use in the test countries, their performance against AID pump design criteria and the feasibility of their manufacture locally. Included, and of particular importance, would be such factors as public acceptance, utilization and maintenance since they are part of the AID design criteria. The pumps to be tested, both shallow and deep well, are to be manufactured in one or both of the test countries chosen. Their performance under village conditions will be monitored systematically and the data obtained will be professionally analyzed, interpreted and evaluated.

In terms of the logical framework matrix format the project purpose are:

a. Further the development of hand-operated pumps, capable of local production, for shallow and deep wells, of optimal design and performance that will gain broad acceptance and usage, reduce maintenance problems and contribute significantly to the success of safe water supply programs in developing countries.

b. Evaluate the design and accomplishments of a previous AID research contract.

c. Promote utilization of the information gathered through that previous research contract.

Detailed listing of project inputs and outputs are subject to negotiation with Georgia Tech. At this stage the following outputs are expected:

a. Complete plans for the local manufacture of the AID shallow and/or deep well pump in the test country, including blueprints and specifications, plus similar data for modifications deemed essential by either of the test site countries.

b. Field test data and analysis for each test country covering the performance of the AID pump and similar data for each other type pump tested. The field test data will cover one year and the comparative analysis will be made with reference to the AID design criteria.

c. A termination report that will include all test data, analyses, evaluations, conclusions and recommendations concerning the AID pump and other designs and the production feasibility of selected pumps in developing countries.

To accomplish these outputs AID must provide the following resources: technical manpower, including consultants, to monitor overall project; funding adequate to permit the contractor and its sub-contractors to provide administrative personnel, salaries and travel for U.S. personnel assigned to the project; salaries for national personnel; vehicles, purchase of pig iron, leather, pipe, etc. required to stimulate the local manufacture of the AID pump; procurement of comparison pumps; and possibly funds to cover well development and pump installation costs.

Initially, it is proposed that two of the following three African countries be chosen as test sites: Kenya, Ghana or Nigeria. In each country selected Georgia Tech will work with a counterpart organization. This organization will be selected by virtue of previous association and Georgia Tech's knowledge of its capability, facilities and interest in promotion of small scale local industry. This information is available as a consequence of the 211(d) grant made by AID to Georgia Tech for "Employment Generation Through Stimulation of Small-Scale Industry". The division of responsibilities between the local organization selected and Georgia Tech will be:

GA. TECH	LOCAL ORGANIZATION
Project planning and Coordination	Bi-weekly monitoring of installed pumps
Selection local organizations	Collect field data
Selection local mfgr. (jointly)	Selection local mfgr.
Technical advice to mfgr.	Assist monitor mfgr. operations
Selection villages for pump installation (jointly)	Selection villages for pump installation
Supervise pump installation	Install pumps
Analysis of field data	Well drilling or rehab. existing wells as necessary
Final report	

The local organizations which have cooperated with Georgia Tech in the past and which will be initially considered for this assignment are:

Kenya - Kenya Industrial Estates, Ltd.

Ghana - University of Science and Technology

Nigeria - University of Ife

The qualifications of Georgia Tech are based on its proven record of providing professional research and guidance needed to enable the State of Georgia to utilize its resources more effectively. The Economic Development Laboratory (EDL) staff of 75 persons offers advisory

and contract services in all aspects of industrial and economic development to communities, local and area development groups, educational institutions, federal and state agencies, international organizations, and private business and industrial firms. Professional members of EDL staff devote full time to the research, service, information and training activities of the Laboratory. Education and experience backgrounds of the staff include six disciplines of engineering, economics, community planning, library science, industrial management, market research, regional planning, geography, industrial relations, agricultural economics, international business, and other related disciplines.

EDL and the local organization will coordinate their efforts to demonstrate that the AID pump design is superior to other pump designs or, failing that, to identify those parts of the AID pump which are inferior and to recommend design improvements therein. The test data will be gathered in such a manner as to be acceptable to governments, private voluntary organizations and multi-national organizations such as UNICEF and WHO that are in a position to provide assistance to village water supply programs in developing countries. Test countries will be selected only where EDL has a written commitment with the local organization specifying that local counterpart personnel are available to make periodic pump checks and to provide any pump maintenance required. Thus it is expected that through this program and the efforts of host country counterparts the utilization of the AID pump will continue and expand and gain general acceptance and usage in the test countries after this project is completed.

Success of this project is dependent upon the following assumptions:

a. The design modification recommended by the previous design contractor (Battelle Memorial Institute) will result in a more sturdy, longer lasting, more effective pump.

b. The fabrication and assembly of the pump is within the capability of some, if not most, indigenous manufacturers.

c. Developing country governments having a genuine interest in improving the lot of their rural populace will undertake the provision of safe water supplies and will utilize the new pump if it is demonstrably superior to the pump now commonly in use.

Part III - Project Analyses

A. Technical Findings and Environmental Assessment

AID through its research program has sponsored work on an improved reciprocating positive displacement pump. This pump consists of a mechanical device which moves a plunger back and forth in a closely fitted cylinder. The cylinder, composed of a cylinder wall, plunger and check valve is located below the static water level in the case of a deep well pump to eliminate the need for priming. Such pumps have been manufactured for decades and there exists a wide range of pumps designed to suit varying water source conditions and levels of need. However, there has been no adequate evaluation and assessment of the general technology, and none for the AID pump specifically.

This study will:

(1) Evaluate the performance of the pump finally recommended to AID by the designers (the Battelle Memorial Institute) against other pump types an used in developing countries.

(2) Evaluate major design and material alternatives concerning, for example, weight of pump; length of pump handle and material; type of cylinder; lower check valve design (poppet or flapper); materials for cups, etc.

(3) Evaluate the feasibility of local manufacture of the AID-Battelle design and/or its modifications.

The most feasible method of performing the evaluation is the direct comparison of other style pumps to those locally manufactured to conform to the AID-Battelle design. This proposed project installs the new design

in close proximity to comparison pumps, subjects both to similar usage stresses, observes unusual wear or failure and ultimately recommends desirable modifications of design. It is the opinion of the sponsoring office that the process is technically sound.

The timing of the project is appropriate for three reasons. First, all AID contracts with the designers have been completed and the work performed should be evaluated against contract provisions and the degree of utilization determined. The project timing is appropriate on that score.

Secondly, AID is by congressional mandate directing its priority attention to the rural poor. The vast majority of the rural poor living in dispersed areas are dependent upon small outcroppings of water or on shallow wells which normally provide contaminated water. The WHO estimated that 85% of the poor do not have safe drinking water available to them. The development of a reliable pump will result in material alteration of that disagreeable figure. The project directly and specifically addresses itself in a timely way to a priority problem of the Agency.

Thirdly, a group of International agencies have recently organized an Ad Hoc Working Group on Rural Water Supply and Sanitation with the objective of accelerating the construction of water supplies for rural people. There is little, if anything, that AID could contribute to that worldwide effort that would be more effective than the capability of local production of a dependable hand pump. Again, the timing is excellent.

Environmentally, the project is sound. It has been designed to result in the expansion of the environmental services which poor rural villages receive and it is anticipated that there will be major, long-term positive environmental benefits flowing from it. Safe water supplies, the facilities for water seal latrine slabs, clean food markets and clean restaurants are a few examples of the types of environmental benefits which may result from the project.

B. Financial Plan

See Budget, page 28. Annex I

C. Social Analysis

Water supply and public health are undeniably linked together. Few people would dissent from that statement, but showing proof of the relationship is another matter. Nevertheless, the almost universal acceptance of some type of relationship between public health and water supply has led many people to postulate the improvement of water supplies as a necessary pre-condition for any significant long-term improvement in the public health status of rural communities in the developing areas of the world.

Within the recommendations and planning documents of development agencies, water supply programs are often proposed on the basis of the considerable health benefits expected to result. For example, an Advisory Committee in Environmental Sanitation within the Pan American Health Union in 1958 concluded that furnishing abundant amounts of good quality water is the best method of reducing disease, accelerating development, increasing tourism, and promoting house construction. (All of these are AID objectives in 1975). The same Committee, when considering the

implication of the Charter of Punta del Este three years later, recommended that plans for environmental sanitation should give the highest priority to water supply development. Furthermore, if only a single public health program was to be selected, the Committee stated that provision of safe and ample water for drinking and personal cleanliness would result in maximum public health dividends.

Another illustration of the widespread recognition of a relationship between water supply and health is the statement of a WHO water supply advisor in Kenya: "A piped water supply is one of the major promoters of health and standard of living in a community". A ministry secretary of the Tanzanian government has written: "No single item can contribute more to the improvement of health in many a village than a constant supply of clean potable water". A Tanzanian private foundation involved in the construction of small village water projects says: "The whole life of a village improves as soon as it has clean water wells. The health of the village improves as the concrete lined covered wells reduce the incidence of malaria, dysentery, typhoid and schistosomiasis." Numerous other examples can be cited.

A few more precise studies and statements are on record. G.F. White et al in "Drawers of Water: Domestic Water Use in East Africa" claim that four out of every five preventable deaths, 44% of preventable inpatient admissions, and 21% of preventable outpatient visits resulting from diseases related to water are due to the diarrheal disorders of dysentery and gastroenteritis. Another key group includes infections of the skin and eyes, such as skin sepsis and ulcers, scabies, tinea, trachoma, and inflammatory eye diseases, which do not result in deaths but do account for one-third of the inpatient admissions and two-thirds of the outpatient visits for preventable water-related diseases.

R.J. Saunders states that the degree of improvement in health which can be expected in any given population depends on the level of health in the first place, cultural habits, educational level, the general physical environment including adequate means of waste disposal, and income level. These factors are obviously inter-related. Saunders concludes with the significant observation: A potable water supply alone is generally not sufficient to stimulate development. However, a potable water supply for residents of any area of a less developed country is a necessary condition for significant economic growth and development. On that basis, the development of a dependable pump (which this project seeks to provide) will bring about an ample, reliable, safe water supply, all of which serves as a precursor to AID's primary objective of improvement of the lot of the rural poor.

D. Economic Analysis

The difficulty of quantifying the direct and indirect economic benefits that will result from improved water supplies and rural sanitation programs makes it impossible to carry out the usual type of economic analysis. It is clear that given the existing pervasive poverty in LDC rural areas, a rural sanitation program will contribute to an improved pattern of income distribution. Safe water supplies may also contribute some attraction to remain in rural areas. The program certainly will not contribute to rural out-migration.

E. Role of Women

Women as an important part of the rural village family will benefit from the provision of rural water supply systems to the same extent, if

not to a greater extent, as men will. A quote from G.F. White illustrates the point: "An African housewife gets up in the morning and soon begins to fetch water. She walks through the thicketed savannah to the water source. This is the habitat of tsetse flies and she is exposed to their unpleasant bites and the risk of sleeping sickness. She reaches the water source in a valley bottom and has to wait her turn. This is the habitat of disease-bearing mosquitoes and of a different tsetse fly more efficiently transmitting sleeping sickness. The stream contains snails transmitting bilharziasis if it is sluggish, or breeds the vectors of onchocerciasis if it is rapid, or may contain guinea worm larvae if it is a mere muddy hole. She collects the water, which today bears a dilute load of human excreta and may contain typhoid bacilli or hepatitis virus. She returns, past the tsetse flies, to her home. As a result of her trip she has been unable to do any digging for the past hour and fewer crops are grown. She prepares the family's main meal. The scarcity of water discourages the washing of hands before the meal and makes washing-up after the last meal perfunctory. Some decayed food may be left on the utensils. Some unboiled water is drunk by her thirsty family, who pick up the germs from it. Two days later father falls sick; the cattle are not tended properly and the cotton is not planted." It is hardly necessary to reiterate that women and children are the principal bearers of water and the provision of safe, convenient water contributes to their health, leisure and to other social amenities available to them.

Part IV - Implementation Arrangements:

A. Contractors and AID's Administrative Arrangements

1. EDL

EDL will administer and coordinate this project and plan and supervise the field test studies.

It will assign Mr. Mardis Price, Senior Research Engineer, as its project manager. Other members of the EDL staff of the University will be available as required. A member of the staff will be assigned specific responsibility for administrative and operational follow-through. Overall direction will be provided by Mr. Ross Hammond, Director EDL.

Active host counterpart participation and support are deemed essential to the purpose of this project and to its effective implementation. It will be the responsibility of the EDL staff to develop host country counterpart involvement in the planning and execution of the field test studies. The nature and extent of that involvement will depend on the counterpart availability of staff, facilities and technical competence, but every effort will be made to maximize it. Counterpart organizations should be in a position to influence village water supply programs and the utilization of hand operated pumps.

The manufacture and installation of test pumps (designs furnished by AID) will be contracted to local agencies and/or companies. Local self-help projects may also be used for installation. The locally manufactured pumps will be installed in lieu of imported pumps in the approximate ratio of 1:1 up to a maximum of fifteen pumps in each test country. Project personnel shall make every effort to choose pairs of installation sites where site characteristics, i.e., type of well, lift

of water, number of people served, etc. impose equal working stresses on the locally manufactured AID design pump as on the imported pump which would have normally been installed.

Drilling of new wells or rehabilitation of existing wells will be held to a minimum to keep costs within budget allocations. Unless specifically approved by AID the cost of well preparation will not be charged to this project.

Worn or broken parts of test pumps will be sent to EDL for analysis and reports as to reasons for wear or malfunction of each piece sent. These reports will become part of the field test data.

2. A.I.D.

The objective of this project is to test the effectiveness of the AID hand pump design. The method of reaching that objective is the installation of pumps manufactured to the AID design in lieu of pumps which would have installed if this project did not exist. Whenever this project is undertaken there must be no interference in the original objective - i.e., of supplying water at the sites chosen. Therefore, should the AID design pump prove to be faulty, to be ineffective and not capable of repair the Contractor is authorized to remove the ineffective AID pump and to procure and install at the expense of this project the pump which would have been installed. Should the latter pump be one not manufactured in the United States special AID administrative arrangements will be required, i.e., the Contractor must be accorded permission to use U.S. funds for procurement of a foreign product. Agency approval of a

waiver of source and origin for procurement of commodities, limited to hand-operated pumps and/or pump parts, is requested. This source waiver authority is of stand-by nature: The alternative pump may not be of foreign manufacture; the pump may be good or better than the alternative pump; in either case use of the waiver would be unnecessary.

B. Implementation Plan (See Annex II - page 29).

The project will be implemented in four phases over twenty-five months as follows:

I.	Project Planning and Coordination	- Two months
II.	Field Test Preparation	- Six months
III.	Field Testing	- Twelve months
IV.	Analysis, Interpretation & Report	- Five months

Phase I will involve consultation with the designated representatives of counterpart countries, and the Economic Development Laboratory (EDL) staff members will design and schedule their support activities in the test countries to provide sufficient lead time to insure proper project implementation. Coordination meetings will be held with personnel of Battelle Memorial Institute for the purpose of reviewing research findings to date and obtaining needed technical and design data. Communication with AID will be maintained by mail, phone, and personal meetings.

Phase II will involve working with the designated counterpart organization in the test countries and other appropriate information sources, EDL staff personnel will screen, through interviews, possible manufacturers of the

shallow and deep well pumps in each selected country. EDL will place the order with the appropriate manufacturer and provide technical assistance to the manufacturer after the order has been placed to insure that necessary pump adaptations are made and substitute materials utilized where necessary, that quality control is maintained and that basic manufacturing cost records are kept by the manufacturer so that economic and cost comparisons can be made. At the end of the pump production run, EDL project personnel will inspect and accept the pumps prior to shipment for installation and testing.

EDL personnel will be available to provide technical assistance and consultation on such matters as the selection of test sites, installation procedures, staff training relating to pump maintenance, field test procedures and data keeping, etc. Coordination in these matters will be extremely important to insure data reliability and to permit comparison with the control group of competitive pumps to be installed and tested as part of the project. In addition, EDL will maintain liaison with Battelle Institute to consult on technical problems encountered in the manufacturing and installation activities.

Counterpart personnel in this phase will have the following responsibilities:

1. Preliminary acceptance and well location identification. Counterpart personnel in countries A and B will obtain national, state, and local government acceptance, as required, of the project and assurance of local willingness at the village level to participate in the project. Fifteen pairs of pump locations will be identified (one AID/Battelle pump and one competitive pump available in-country). See Annex III - page 30 for siting criteria. Determination will be made as to

the number of present wells which can be utilized replacing existing pumps and how many new wells will be needed.

2. Assistance in the manufacturing of AID/Battelle pump in Country A This assistance will involve close liaison with the EDL field engineer in the selection of foundry/machine shop capable of producing good quality castings and machinery to the required tolerances, the ordering and purchase of approximately 36 pumps (six spare for maintenance and replacement purposes), the monitoring of the manufacturing process, participation in the pump assembly, inspection, testing, and shipment of the pumps (18 to each counterpart).

3. Pump installation and preliminary on-site test. Where necessary, new wells will be drilled by an acceptable local contractor. In conjunction with the EDL field engineer, counterpart personnel will assist in the installation and testing of 15 pairs of pumps in each country. Pumps will be tested and assurance obtained that they are in operating order. Use demonstrations, if needed, will be conducted at the village level.

Phase III includes counterpart organizations conducting field test data collection and record keeping under the general supervision of the EDL project director. During this 12-month period, copies of all field data and relevant information will be transmitted on a monthly basis to the EDL project director so that data can be systematically analyzed and compared to insure uniformity and comparability, significant trends noted, and the evaluative process started. During the field test period, EDL personnel will take at least one field trip to each test country to consult with counterpart personnel responsible for the field test data to insure data uniformity, reliability and comparability and to provide on-site technical assistance to solve problems which may have surfaced.

During this phase counterpart personnel will be responsible for visiting the pump locations at bi-weekly intervals for 12 months after installation, data collected, necessary maintenance conducted, problems noted and corrected, and data and other information forwarded by mail to EDL on a regular basis. EDL field engineers will participate in the monitoring when in-country. See Annex IV - pages 30 to 34 - for suggested "check sheets" to cover bi-weekly inspections.

Phase IV covers analysis of data. Utilizing all field data and relevant information derived from the field tests, EDL personnel will analyze, interpret and evaluate the data. This will permit the AID/ Battelle pump to be compared with competing pumps in a selected number of countries in terms of the following:

- Operational performance in the field. See Annex IV-A or B.
- Maintenance requirements and pump reliability. See Annex IV-C.
- Competitive costs analysis and economics of in-country manufacturing.
- Manufacturing problems encountered.
- Recommended design changes and future utilization.
- Public acceptance and marketability - See AID objectives-page 5.
- Battelle design characteristics and specifications - See Final Research Report AID/csd-3305.

EDL will prepare a final report summarizing the entire project findings, analyzing and evaluating same, and providing conclusions and recommendations for future -ourses of action. This report will be submitted to AID for review and comment prior to final publication of the report.

Installation sites in each test country accessible by motor vehicle will be selected in rural localities with a population of at least 500 persons and where the use of hand pumps for drawing water is an accepted and established practice in the community. Villages will be selected whose population and their leaders accept the project and are willing to participate. As far as possible, test sites will be grouped to facilitate monitoring and groups will be diversified as to geographic location within the test country, with differing water table levels to permit the testing of both shallow and deep well pumps on roughly a half and half basis. To allow for comparison of the AID pump with other similar type pumps generally in use in the test country, sites will be selected that already have pumps in use or are located near communities that do. The AID pumps will be installed near to, perhaps one-quarter mile away, from existing pumps which, to the extent feasible, will be representative of locally accepted and widely used pumps in the host country and include major local designs and material modifications. Both the AID pumps and the existing or newly installed local pumps will be monitored. Needed repairs and modifications will be made promptly and recorded.

Data on existing pumps as to type, age, repair and maintenance histroy will be collected for each test site. In addition, a general survey of the use, development and experience with hand-operated pumps, major local design and material alternatives, material availability and local manufacturing capabilities in each test country will be made to supplement the field monitoring data.

Field monitoring of pump performance, both technical and non-technical, and parts will be conducted through bi-weekly inspections of test installations. A simplified, standardized checklist will be utilized to insure uniformity of reporting and allow for computerized analysis of data. To monitor non-technical aspects of test pump performance, the bi-weekly inspections will probe and record data on subjective factors such as public acceptance, utilization, attitudes, opinions and comparative evaluations of the local people in the test sites with regard to the performances and design of the AID and other test pumps.

All field test data, surveys and supplementary information will be forwarded to the contractor where it will be tabulated, analyzed, interpreted and evaluated. The project termination report will include all data, analyses and evaluations of the field tests and conclusions with regard to the relative performance and merit of the AID pump. The report will also contain conclusions and recommendations on modifying the present design and on the utilization and production of the AID pump in developing countries.

See accompanying Project Plan for breakdown of major project activities.

This entire project is an evaluation study. It will evaluate the results of prior AID research directed toward the design of a dependable, acceptable and easily maintained deep or shallow well hand operated pump. See page 5 for objectives of that research effort. Meanwhile, the project contributes to AID's goal of improving the health of the poor majority through alleviation of bacterial pollution in the participating communities. Project evaluation will be made in three stages. These stages are:

1. A baseline study to permit evaluation of the provision of improved quality and increased availability of water. EDL will be asked to collect pre-project data in each country reflecting existant water conditions. This data should be submitted in the form of a report to AID within three months of commencement of project.

2. A meeting of AID and Georgia Tech officials working on the project at the end of each of Phases II and III. Progress and actions taken will be recorded in the form of Project Appraisal Reports. These PAR's prepared by AID staff are due 8 and 20 months after commencement of project.

3. Final report of project prepared by contractor will be due 26 months after Project commencement.

D. Conditions, Covenants.

None.

BATTELLE PUMP BUDGET

Budget Item	Phase I Project Planning and Coordination	Phase II Manufacturing (one country)	Phase II Installation & Testing - A	Phase II Installation & Testing - B	Phase III Field Monitoring B	Phase III Field Monitoring B	Phase IV Analysis & Report A & B	Project Totals
Personal Services								
Proj. Dir. @ $1800/mo.	$3,600	$ 3,600	$ 3,600	$ 3,600	$2,700	$2,700	$ 5,400	$ 25,200
Professional Staff								
Support Personnel	600	-	-	-	300	300	600	1,800
Overhead & Fringe Benefits								
Domestic @ 77%	3,234	-	-	-	1,617	1,617	4,620	11,088
International @ 54%	-	1,944	1,944	1,944	486	486	-	6,804
Materials and Supplies	-	9,750	14,000	14,000	1,000	1,000	1,500	41,250
Travel								
International	-	2,800	1,400	1,400	1,400	1,400	-	8,400
Domestic	600	200	-	-	-	-	400	1,200
Per diem (Internat'l.)	-	1,750	1,750	1,750	420	420	-	6,090
Counterpart Grants ($11,000 & $13,000)			13,000	11,000				24,000
TOTALS	$8,034	$20,044	$35,694	$33,694	$7,923	$7,923	$12,520	$125,832

'roject No. _____

'roject Title AID/Battelle Pump Field Test

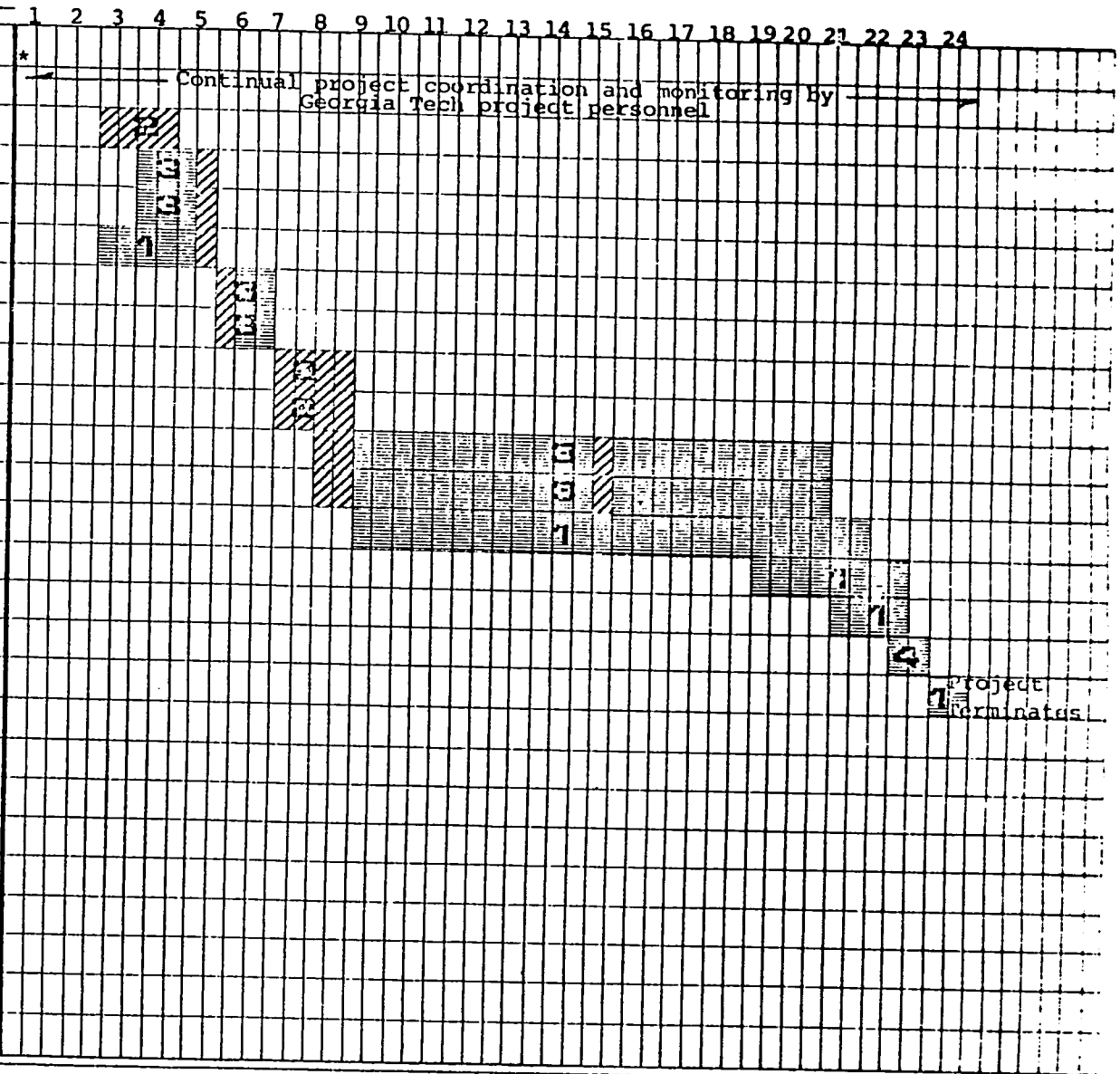
'roject Director Mardis L. Price

ANNEX II

PROJECT PLAN

Months

1. Project approval and activation
2. Project planning and coordination
3. Pump manufacture - Country A
4. Govt. approval & site selection - A
5. Govt. approval & site selection - B
6. Purchase of competitive pumps - A & B
7. Well drilling as required - A
8. Well drilling as required - B
9. Pump installation and testing - A
10. Pump installation and testing - B
11. Field monitoring and reporting - A
12. Field monitoring and reporting - B
13. Analysis of data
14. Evaluation and report preparation
15. Draft report to AID
16. AID review of draft
17. Final report to AID



LEGEND

1. Georgia Tech
2. Georgia Tech and counterpart personnel
3. Counterpart personnel
4. AID action

Georgia Tech personnel in counterpart country

Annex III

Criteria for the Selection of Villages

1. The village is located in a rural area. Semi-urban areas should be avoided.

2. Villages should be reasonably close together or at least in groups to facilitate monitoring.

3. The village should be accessible by motor vehicle.

4. A well project is in progress or planned for the immediate future which will include at least two wells in the village.

5. The village will have a population of at least 500 persons.

6. The village population and their leaders accept the project and if possible are willing to participate.

7. Villages where hand pumps have been in use previously are desirable.

8. If necessary existing pumps may be replaced by the test pumps.

Annex IV-A

Installation Report

Pump No. _____

Location _____

Date _____

1. Population of Village _____
2. Well Water Used For:

	Percent
Drinking	_____
Laundry	_____
Bathing	_____
- - - -	_____
- - - -	_____

3. Existing Wells - No. _____ Approx. Time in Use _____
4. " Hand Pumps No. _____ " " " " _____

Pump Installations	AID-Battelle	Traditional
5. Depth of Well		
6. Water Level		
7. Diameter		
8. Number of People Served		
9. Type of Pump		
10. Make of Pump		
11. Condition of Cover or Slab		
12. Pump Intake Depth		
13. Strokes/5 gallons		
14. Handle Force		
15. Sand in Pumped Water		
16. Person Responsibile for Maintenance		

Notes:

Annex IV-B

Monthly Inspection _____
Date

Shallow Well Installation

Pump No. _____

Location _____

Time in Service _____
Months

	AID-Battelle	Traditional
1. Plunger Rod (2203)		
2. Pivot Pins (2 ea)(2005)		
3. Holes-Handle (2008)		
4. " -Rod End (2004)		
5. " -Pump Cap (2006)		
6. Bolts Cap to Body		
7. " Base to Slab		
8. Other -		
9. Sanitary Condition		
10. Number of People Served		
11. Sand in Pumped Water		
12. Strokes/5 gallon		
13. Handle Force		
14. Maintenance		

15. Repairs:

16. Parts Replaced

Notes:

Annex IV-C

Monthly Inspection _____
Date

Deep Well Installations

Pump No. _____

Location _____

Time in Service _____
Months

	AID-Battelle	Traditional
1. Pump Rod		
2. Rod Nut		
3. Rod End 2004		
4. Rod Pivot Pin 2013		
5. Sliding Block 2026		
6. Holes - Handle 2008		
7. " - Pump Cap 2027		
8. " - Fulcrum 2029		
9. Bolts Cap to Body		
10. Handle Pivot Pins(2)2005		
11. Bolts Base to Slab		
12. Other - - - -		
13. Sanitary Conditions		
14. Number of People Served		
15. Sand in Pumped Water		
16. Maintenance		
17. Repairs		
18. Parts Replaced		

Notes:

Annex IV-D

6 months Inspection _____
Date
(Additional Items)

Pump No._____

Location_____

Time in Service_____

	AID-Battelle	Traditional
1. Cups - (2019)		
2. Poppet - (2019)		
3. Poppet Sear - (2020)		
4. Cylinder - (2014)		
5. Flap Valve Assembly - (2015)		
6. " " Seat - (2016)		
7. Other		

8. Repairs:

9. Parts Replaced:

Notes:

Annex V-E

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : CM/COD/IT, Mr. Morton Darvin

THRU : TA/PPU, Mr. John Gunning

DATE: March 12, 1976

FROM : TA/H, Lee M. Howard, M.D.

SUBJECT: Justification for Non-Competitive Procurement - Per AID PR 7-3.101-50

I recommend that we negotiate only with the Economic Development Laboratory (EDL), Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Georgia for the provision of management and evaluation services required in conjunction with the AID project "Utilization and Evaluation of the AID Hand Pump Operated Under Village Conditions" for the following reasons:

1. Capability. The project involves the manufacture and assembly of hand-operated water pumps in an LDC, i.e., it requires the development of small scale industry. Georgia Tech, by means of an AID 211(d) grant, has been involved in this identical area for several years. The proposed contractor has signed formal agreements with seven LDC counterpart organizations to stimulate local development through the expansion and diversification of existing industry and to generate new industrial enterprises, particularly, but not exclusively, in the rural areas of those countries. Subsuming the pump project to the 211(d) objectives and methodology is a natural fit.

In addition, EDL is a part of one of the largest engineering and science institutions in the U.S. The parent organization is unique in that it is a results-oriented organization, with a prestigious 500-person staff, extensive laboratory facilities, and with a long history of pragmatic domestic and international research, service, training, technology transfer, and development activities.

2. Prior experience. The EDL has provided a broad spectrum of economic development services for 20 years domestically and 12 years internationally. During these years, problem-solving management and technical assistance have been provided to more than 4000 established and new manufacturers and businesses,and almost 700 published analytical and evaluative research reports have been produced. The EDL staff has worked in approximately 15 states in the U.S. and 30 developing countries. In the past year, 13 international development projects in 10 countries have been undertaken. Most importantly the linkages established under the 211(d) grant program contribute experience which is vital to the objectives of the current project.

5010-108

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3. Facilities and Equipment. The presence of physical U.S.-based facilities are of minor importance to an evaluation project conducted overseas. However, as possible backstop facilities, the Engineering Experiment Station has extensive laboratories, fixed and mobile equipment, machine shops, prototype design and construction areas and all of the analytical and computer hardware and software associated with an outstanding applied research institute. In addition to the main library (one of 12 national depositories for government documents) there are a number of other information resources. The on-line data base linkage with other computer information centers provides more than 8,000,000 citations in the network.

4. Investment Required from Another Contractor. The EDL staff has more than 300 man-years of development experience. Over the years they have produced more than 650 research reports, surveys, analyses, directories, etc. In addition, more than 200 unpublished reports on various development aspects have been produced. Again, the EDL has the basic organization, linkages and experience of working with the specific LDC units which will undertake the acquisition, installation and testing of pumps to be evaluated. The staff experience and the facilities developed over the years represent an investment of millions of dollars which would be expensive, if not impossible, to replicate.

5. Time schedules. Project planning allocates 25 months to conduct a 12 month field evaluation. Time schedules are not expected to become critical. However, if problems threaten the projected completion date, the EDL is staffed with full-time research and support personnel, free to travel on short notice (as opposed to relatively restricted academic personnel). This quick response capability ensures that schedules will be maintained and that reports and other deadlines will be met.

6. Staff expertise. In-country manufacture of pumps for the field test is an important aspect of the project. EDL staff capabilities include experience in foundry and machine shop activity, in production, quality control, and related aspects of producing test pumps. The EDL staff is used to working in both urban LDC areas (where presumably the pumps will be made) and in rural areas (where they will be installed). Even more importantly is the staff of the counterpart organizations available through EDL. These men know the problems of their own country and possess an empathy with their rural countrymen which will facilitate and expedite project implementation.

Other organizations believed to possess the requisite capability and interest were approached. These included:

1. Battelle Memorial Institute, Columbus, Ohio. The Institute would undertake the work. However, the supervision would be by an employee known to be more interested in improved design than in field testing; Battelle has a history of being quite costly; and the practice of an institution evaluating its own prior work is somewhat unsound.

2. Cooperative for American Relief Everywhere (CARE) was willing to incorporate the test in a village water supply improvement program to be conducted by CARE but wished AID to provide funds for project items not associated with the test program. Total costs would have been approximately four times funds available.

3. The British Intermediate Technology Development Group (ITDG) showed interest when approached in London in October 1975. They wished to undertake a large scale (100 pumps, 3 year) project at a cost double the funds available from AID. To date, there has been no formal proposal.

On the basis of experience, capability, staffing, and overseas linkages, this Office considers the Economic Development Laboratory, Georgia Institute of Technology as the preferred contractor.