DEMOCRATIC SOCIALIST REPUBLIC
OF SRI LANKA

MINISTRY OF LANDS, IRRIGATION
&
MAHAWELI DEVELOPMENT

IRRIGATION SYSTEMS MANAGEMENT PROJECT
USAID CONTRACT 383-0080-C-00-78035

END OF TOUR REPORT

By

S. BALASINGAM
SENIOR OPERATION & MAINTENANCE ENGINEER

SHELADIA ASSOCIATES INC.,
JANUARY 1992

END OF TOUR REPORT
ENG. S. BALASINGAM - SENIOR OPERATION & MAINTENANCE ENGINEER

TABLE OF CONTENTS

PREFACE

My assignment as a Senior Irrigation Operation And Maintenance Engineer on the USAID Irrigation Systems Management Project under the Sheladia Associates Technical Assistance Team is considered by me as a rare opportunity in my professional life with the GOSL. This opportunity has enabled me to witness very closely the intricacies of Irrigation Systems Management Practices in three Districts of Shri Lanka which comprise the bulk of the irrigated agricultural extent of the Country.

While discharging my responsibilities, I was very mindful about the efforts taken by the different sectors for the accomplishment of the ISMP objectives to accelerate the outflow of Project benefits to the beneficiaries. As such, at times, I had been misconstrued to be over-enthusiastic in providing assistance and advice to the Irrigation Department and IMD personnel. This may be true, however, I was quite conscious about the tremendous effort taken by the GOSL in harnessing and utilizing enormous amount of resources in multiple forms for the betterment of the disadvantaged farming community of the Country.

I always strived to inculcate a high degree of sensitiveness among the people who were engaged in discharging public responsibilities as the lack of this had been one of the major impediments for ensuring satisfactory participatory management. During my two year assignment, I prepared many brief "Action Plans " where deemed necessary, in order to streamline the implementation strategies among different systems. These "Action Plans"are attached to this Report as Annexures.

All in all, I enjoyed very much associating with a wide cross section of multi-disciplined Agency personnel and a very dynamic farming communities in these three Districts.

I appreciate very much the guidance and invaluable advice given by the SAI Chief-of-Party and those who were associated with me during this period.

Finally, I wish to express my sincere regards to the Director of Irrigation and the USAID Project Officer for providing me this golden opportunity to serve on this ambitious and well conceived and designed Irrigation Systems Management Project under Sheladia Associates Inc.

CHAPTER I

PROJECT ASSIGNMENTS

The Consultant was recruited to fill the position of the Senior Irrigation O & M Engineer on the ISMP Technical Assistance Team . Initially, he was entrusted with the overall ISMP implementation responsibilities in the Gal Oya LB and RB Systems, Ampara Range. The Consultant's Scope of Work for the above position is given in the Exhibit I-I .

The Consultant assumed responsibilities at the Ampara Office in February 1990 and initiated Project implementation activities with great enthusiasm on a revised schedule prepared by him in consultation with the relevant ID staff.

Initially, all aspects of project implementation activities progressed quite satisfactorily to achieve the planned targets. Most of the ID personnel were found to be dynamic and worked hard to accelerate the progress of achievements and to adhere to the technical requirements and quality of work of the jobs at hand. Unfortunately, all the operations had to be suspended abruptly in June 1990 with the outbreak of violence in the District.

After that date, the Consultant was temporarily transferred to the Ridi Bendi Ela Scheme in the Kurunegala Range hoping that the violence could be contained within a short period of time . However, that hope was completely shattered with the rapid escalation of violence throughout the Ampara District. Therefore, the Consultant was permanently posted to the Ridi Bendi Ela Scheme where the Consultant's operation centre was established at Kurunegala during the first week of July 1990.

During early July 1990,on the request made by the Hon.Chief Minister for the North Western Province, USAID agreed to expand the scope of the Project rehabilitation activities as a savings in Project funds was anticipated due to the close down of Ampara operations. Since the Consultant's O & M Engineer was available on a full time basis for the Ridi Bendi Ela Scheme, he was requested to assist ID expand responsibilities as envisaged in the proposals put forward by the Hon. Chief Minister.

The O&M Engineer's revised assignment on the Ridi Bendi Ela Scheme were:

- Assisting ID in the investigation, design ,planning and quality control supervision of the Priority Rehabilitation Works and the construction of Water Measurement Structures in the RBE Scheme.

- Assisting and guiding the ID in the investigation, design, construction planning and quality control supervision of the modernization works of the Headworks and the Inlet Canal of Ridi Bendi Ela Anicut and Transfer System.

- Assisting the ID in the investigation, planning, design, and in the development of proposals for the extension of the Right Bank Main Canal of Magallewewa in order to feed a series of village tanks through a 12 km long proposed feeder canal.

- Preparation of Action Plan for improving System Operations

- Assisting the ID in the preparation of Preventive Maintenance Programs of the rehabilitated tracts.

- Assisting the ID in updating system data and in the preparation of Updated Issue Tree of the System.

- Assisting the Chief Of Party / Expatriate O&M Engineer in the certification of completed works for USAID reimbursement.

- Assisting ID in the implementation of O&M Training Programs funded under ISMP.

On March 15, 1991 the Consultant was transferred to the SAI Polonnaruwa Office where he was assigned to assist the Expatriate O & M Engineer and the ID personnel in the preparation of the Annual Maintenance Plans for the Main Systems and Distributary Canal Systems of the four Schemes in the Polonnaruwa Range.

Though the duties of the Consultant were not specifically defined he was directly involved in the following responsibilities;

- Assisting the ID/IMD in the finalization of the command areas of Ditributary Canal Systems in each Scheme

- Assisting ID in planning and conducting Walk- Through Maintenance Surveys of the Main System Components and Distributary Canal System Components.

- Assisting the ID in the preparation of Quantity Estimates, Cost Estimates and Annual Maintenance Plans based upon the Walk Through Maintenance Surveys.

- Developing criteria for different items of maintenance works of the different parameters of the irrigation systems.

- Furnishing suggestions and recommendations to ID and IMD for the implementation of the Annual Maintenance Plans .

- Assisting the Chief of Party and the Expatriate O & M Engineer in updating the Maintenance Manuals of the Irrigation Department.

In addition to the above responsibilities, the Consultant was required to monitor the project implementation activities of the Ridi Bendi Ela Scheme and Gal Oya Scheme on a part-time basis.

Also, the Consultant was called upon to assist the Chief of Party in the inspection of partially completed rehabilitation works and in expediting the Operation Surveys for the identification of monitoring and outflow nodes pertaining to the Computer Assisted Operation Model. In addition, the Consultant participated in many Training Courses, Workshops, Seminars and Presentations to assist the Technical Assistance Team's Training requirements under the Project.

CHAPTER II

PROJECT STATUS ON MARCH 1990

GAL OYA SYSTEMS

The Project Area of Gal Oya Scheme under the ISMP is comprised of the Left Bank Tracts of Senanayake Samudra Scheme which is 25,000 Ha in extent and the Right Bank Tracts of 13,957 Ha in extent. As envisaged under the ISMP Project Paper, the scope of rehabilitation and modernization works in Gal Oya Scheme was comprised of two levels of efforts on the Right Bank Main Cnal, which had deteriorated badly, a relatively high level rehabilitation program called Pragmatic Rehabilitation was planned. While on the Left Bank Main and Branch Canals only a Preventative Maintenance Works was planned because those canals were rehabilitated during 1980 to 1985.

During March-April 1990, the Farmer Organization Specialist, two Program Assistants and an Engineering Assistant were assigned to the Technical Assistance Team based at Ampara. Therefore, the implementation program was revised in consultation with the relevant ID and IMD personnel to regularize the procedures and to accelerate the program as work in the Gal Oya System was delayed for two years after the start of the Project.

The Pragmatic Rehabilitation works of RBMC Tracts entailed extensive investigations, design, and planning process before awarding contracts. In addition to the typical rehabilitation and modernization works, the following major improvement works were incorporated into the Sub-Project proposals of the RBMC:

- Modification to the radial gated sluice structure at the off-take of the Right Bank Main Canal.
- Construction of an additional barrel for the syphon of the RBMC to increase the discharge capacity of the canal from 650 cusecs to 1000 cusecs.
- Major improvements to the link canal from Alahena Tank to Malayadi Tank to allow for the above greater discharge.
- Construction of an additional sluice structure for the Malayadi Tank.

The cost estimate for the construction of the additional barrel of the syphon had been approved and construction work commenced during late February 1990. Due to difficulties encountered in dealing with the large quantity of drainage water, the construction works progressed very slowly. In addition, the contract management required frequent visits of senior technical personnel for ID head office in order to issue instructions to the contractors to assist in the program of work.

The status of Surveys, Planning, Design and Construction for Pragmatic rehabilitation on the RBMC and Preventive Maintenance on the LBMC activities as of March 1, 1990 is shown below:

PRAGMATIC REHABILITATION OF RBMC

	Main Canal	Branch Canal	D-Canal	F-Canal
Surveys:	100%	90%	5%	0%
Planning & Design:	80%	60%	0%	0%
Construction:	35%	0%	0%	0%

Cost estimates were prepared for the rehabilitation of the first 28 km of RBMC and eight Sub-Projects were submitted to USAID for approval and issuing Project Implementaiton Letters (PIL's).

PREVENTATIVE MAINTENANCE OF LBMC

With regard to the above component ,the preparation of cost estimate did not involve too much detailed surveys and planning activities. Estimates were prepared using only tape measurements as the nature of work involved was not extensive.

Cost estimates for the LBMC, the Uhana Branch Canal, the Gonagolla Branch Canal, and the Weeragoda Branch Canal were approved and initially two Sub-Projects were approved by USAID and PILs established.

Seven Technical Assistants were deployed on full time basis for implementation of works in RBMC and four Technical Assistants were involved in LBMC works on part time basis as they were also involved in other non-project works. All construction works were undertaken by local private contracting agencies on Measurement Contract Agreements.

There appeared to be lack of understanding and awareness of the overall and specific objectives of the ISMP among the majority of the ID Technical personnel. The implementation strategies and related practices adopted by the different personnel reflected shortcomings and non-uniform practices which could have been avoided had better awareness program initiated at the beginning of the Project.

Apart from the above limited scale of rehabilitation works , actions were not initiated to operationalize the other O & M components. The System Operation activities required collection

of quite a lot of data from the system. The System Maintenance activities were not initiated in the RBMC Tracts due to non-existence of farmer organizations during the early stages of the Project.

RIDI BENDI ELA SCHEME

The RBE Scheme consists of the following three stages of development areas:

Stage I: Anicut Headworks, Inlet Canal and an irrigable area of 285 Ha. adjacent to Inlet Canal.

Stage II: Magallewewa Headworks, Canal System and an irrigable area of 2085 Ha.

Stage III: Blocked out areas beyond the Stage II area without irrigation facilities an area of 260 Ha.

Under the ISMP proposals, the canal systems of Stage II area and the Field Canals and D Canals of Stage I area were planned for rehabilitation. However, there was no proposal to effect any development activity in the Stage III area.

Since the canal systems referred to above were partially rehabilitated under the Kurunegala Integrated Rural Development Project Funded by the World Bank during 1979 - 1986, the scope of work was limited to Priority Rehabilitation and for constructing new Water Measurement Structures wherever required.

The implementation activities commenced during 1988 and cost estimates were under preparation for three Sub-Projects amounting to a total of Rs. 2,000,000. Also, the new Water Measurement Structures in the LBMC and LB/LBMC canals were constructed during 1988/89 pending opening up PIL for those works by USAID. Apart from the above activities, the Expatriate of a O&M Engineer assisted the ID staff in carrying out Operation Surveys of the entire canal systems and helped to prepare guide lines for the ID staff to pursue further action.

With the assistance of the SAI Consultant's Operations Engineer, a few stations in the RBMC and the LBMC were calibrated by the ID personnel during the Water Measurement Training Session conducted under ISMP during early 1990. Also, the Expatriate O&M Engineer assisted ID personnel in carrying out maintenance surveys of sample areas while the ID personnel carry-out the maintenance surveys of the balance of the areas.

With the posting of a new Project Manager for the RBE Scheme, the Farmer Organizations were re-activated to participate more effectively in all ISMP activities. However, the demarcation of

command area boundaries of different Distributary Canal Organizations (DCOs) was not finalized and deployment of IOs was delayed.

POLONNARUWA SYSTEMS

When the Consultant assumed duties in Polonnaruwa office in March 1991, the status of the Operation and Maintenance Components was different from the Ampara and Kurunegala Systems.

The Consultants O&M Engineers and Engineering Assistants were engaged in the preparation of the Annual Maintenance Plans and Cost Estimates of the Giritale Main System and 12 Distributary Canals (DCO) Systems based upon the Walk Through Maintenance Surveys carried out by them in collaboration with the relevant ID and IMD personnel and farmer representatives. Also, the Consultant assisted the ID personnel of the other three Schemes to prepare the above documents pertaining to the sections of the Systems which were fully rehabilitated.

Formation of DCOs were in progress in all the Schemes, however, the demarcations of command areas of the DCOs was not yet finalized. Hence the Walk-Through Maintenance Surveys of the Distributar Canal Systems could not be commenced. However, the Consultants' Training Specialist's, Dr. John McCallum and Mr. H.A. Premarathna conducted several training sessions to all the field level agency personnel and for the members of the farmer organizations in the preparation of Annual Maintenance Plans and related Exhibits. Man months of training was imparted to these people to facilitate them to expedite the development of the Annual Maintenance Plans for the Main and Distributary Canal Systems in all Schemes of the Project.

CHAPTER III

PROJECT ACCOMPLISHMENTS DURING ASSIGNMENT

A. GAL OYA SYSTEMS

The Consultant's period of direct involvement in the implementation of ISMP activities of the Gal Oya Systems are very short. Therefore, reference is made to the specific accomplishments which were of significant importance and that were deemed commendable due to the Consultant's contribution.

As remarked in the Chapter II, there had been management constraints which contributed to the wide variation in the implementation strategies in different locations of the Systems. Therefore, the need for an orientation session coupled with an action training activity for the ID personnel was recognized by the Consultant due to his intimate involvement in the key issues of the Project. A wide cross section of ID personnel were interviewed and their problems and the needs were documented. These were refined further in consultation with the senior members of the ID staff and the SAI Engineers. Hence, it was possible to hold a Two-Day Orientation and Action Training Session during mid March 1991 to provide guidance to the ID staff for initiating uniform practices in the implementation of the PR and PM works on the Gal Oya RBMC and LBMC Systems respectively.

This two day orientation session had been the first formal exposure for the majority of the TAs and WSs. At this session the ISMP concepts and implementation strategies were presented in detail. The extract of the comments and recommendations of the above review session are shown in Exhibit III-I.

One of the major construction efforts started on the RBMC was the reconstruction of syphon structure at Station 6 km +120m. Unfortunately during construction, the Inlet Structure of the syphon collapsed on 28/03/1990 when the water delivery commenced for the 1990 Yala Season cultivation. Because of this the water delivery for more than 12000 Ha was completely disrupted for a period of 21 days. The situation in the command area became quite critical and caused tremendous pressure on the ID personnel. However, the ID personnel under the personal direction of the DDI/Ampara, faced this formidable task of reconstruction of the damaged section of the syphon amidst the threat of intermittent monsoonal rain. The reconstruction was completed during an around-the clock period of three

weeks and the water delivery was resumed for the 1990 Yala Season without any significant disturbance to the cultivation activities.

When the Consultant was transferred out of Ampara Range and acquired fresh responsibilities with his posting at Polonnaruwa on permanent basis in March 1991, his involvement in the Gal Oya System was reduced to assisting the IE and TAs in the preparation of Annual Maintenance Plans and Cost estimates of the Main and the Distributary Canal Systems.However, because of conditions in the area in 1990 and the restricted mobility of the ID staff in carrying out these activities, no major progress in this regard was possible until late July 1991.

At that time, additional transport vehicles were provided and the Expatriate Consultant Staff were able to visit the Systems. These efforts developed some momentum among the agency personnel to commence the preliminary activities such as demarcation of command area for the Distributary Canal Systems and initiation of the Walk - Through Maintenance Surveys in the safe zones of the Scheme.

As of December 31, 1991 the ID staff completed the Walk-Through Maintenance Surveys of the following components of the LBMC and RBMC.

- Senanayake Samudra Headworks - 100 %
- LBMC (0.0-34.0km) - 100 %
- Uhana Branch Canal(15.20 km) - 100 %
- Mandur Branch Canal(15.40 km) - 100 %
- Gonagolla Branch Canal (8.0 km) - 100 %
- RBMC (0.0 - 35.2km) - 100 %
- 33 out of 72 Tertiary Systems(DCOs) in the LBMC.
- 10 out of 36 Tertiary Systems(DCOs) in the RBMC.

In addition, the Cost Estimates and Annual Maintenance Plans of the Senanayake Samudra Headwrks and the LBMC and the three Branch Canals listed above were finalized based upon these Walk -Through Maintenance Surveys.

B. RBE SCHEME - KURUNEGALA

1. Priority Rehabilitation.

The Priority Rehabilitation works were under implementation throughout the Scheme commencing from September 1990. Three Sub-Projects costing a total of Rs: 1.20 million were approved by USAID and the implementation of all the items of works under these Sub-Projects were completed during 1991.

The implementation of the works under those Sub-Projects were very closely monitored by the Consultant Staff to ensure good planning, design and construction quality control. The certifications of completion of these works were prepared by the Consultant and were transmitted to USAID for reimbursement during 1991.

Five additional Sub-Projects costing a total of Rs:3.0 million were approved during 1991 and the implementation of these five Sub-Projects was entrusted to the respective DCOs on a contract basis. About 60 % of those construction works have been completed as of 31/12/1991. In addition, the cost estimates for the remaining Priority Rehabilitation works have been drafted and submitted for implementation during 1992.

The Sub-Projects which were more than 50 % complete were inspected by the Consultant and certifications for USAID reimbursement were submitted to DDI/Kurunegala for onward submittal to USAID.

With the posting of an Engineering Assistant on full time basis to the RBE Scheme during mid-June 1991, the Consultant was posted to Polonnaruwa Range and thereafter required to visit the RBE Scheme only on occasions as determined by the Chief of Party.

2. Water Measurement Structures.

Based upon the Operation Surveys conducted by the Expatriate O&M Engineer, new water measurement structures were constructed in the LBMC and LB/LBMC at a cost of Rs: 80,0000 during 1988/89. In addition, all the essential modifications required for the existing water measurement structures in the above canals were completed in that year. The cost estimates for the construction of new water measurement structures and for modification and or repairs of the existing structures in the RBMC tracts were approved for Rs: 260,000 during 1991. However, the implementation was not completed as other construction works on the Inlet Canal were given higher priority.

3. System Operations

It had been a quite difficult task for the Consultant to solicit the efforts of the ID personnel for initiating necessary activities envisaged under the Systems Operation Program for the RBE Scheme. Prior to the posting of the Consultant to this Scheme, operation surveys were completed and a few stations in the RBMC and LBMC were calibrated. Apart from these few stations, all other calibration activities had not commenced.

Therefore, the Consultant tried to accelerate the progress by initiatives of the TAs concerned. As a result, it became possible to accelerate the implementation of the program. The accomplishments under this component as of December 31,1991 are shown in Exhibit III-2.

As a result of these achievements shown in Exhibit III-2 , the System Operations Program of the RBE Scheme can be taken as a model for other Schemes.

4. System Maintenance.

In the RBE Scheme, the main activity under this component was the preparation of the Annual Maintenance Plans and the Cost Estimates for the different components, namely the Main System Components to be maintained by the ID and the Distributary Canal Components to be maintained by the DCOs. The implementation of these Annual Maintenance Plans was planned to start in 1992.

Accordingly, the documents pertaining to the Main System Components have been finalized by the ID staff during the first quarter of 1990 based upon the guidelines and recommendations furnished by the Expatriate O&M Engineer.

The finalization of the command areas of the Ditributary Canal Systems (DCOs) was expedited and TAs and WSs were deployed to take care of different clusters of the Distributary Canal Systems during 1990. The preparations of the Annual Maintenance Plans and related Exhibits of the eleven Distributary Canal Systems in Ridi Bendi Ela Scheme were completed during 1991. The above documents pertaining to the three DCO Systems which were qualified to take over the O & M activities from ID were reviewed by the Consultant and transmitted to the relevant TAs for developing Sinhala version of the Annual Maintenance Plans for submission to the respective DCOs.

The Blocked Out Plans of the eleven Distributary Canal Systems were prepared in draft form using the 1963 Specification Surveys Plans of the Stage I and II areas.

Three Operation and Maintenance Units for servicing the Main System and the eleven DCOs were commissioned in 1991 and be made fully operational when the materials and will equipments required are furnished to these centers during early 1992.

5. Modernization of RBE Anicut Headworks and the Inlet Canal

The proposals for the modifications and improvements of the anicut headworks were prepared by DDI/Kurunegala and referred to the ID Headquarters for approval. The response from the ID Headquarters was delayed as studies regarding environmental aspects have to be carried out. Therefore, the implementation of the proposals was suspended for several months until a decision to implement the proposals was approved.

The survey investigation, planning and design, and the preparation of cost estimates for the modification of the 20 km long Inlet canal were completed by a team of senior TAs assisted by the Consultant's O&M Engineer during April 1991. However, detail quantity estimates were not completed for the items for which lump sum provisions were allowed.

The implementation of the modification works commenced in late April 1991 even though this was not originally planned during the above period. The Consultant's O&M Engineer was not in agreement with this starting date as difficulties in setting out the bed grade and other dimensions in wet and saturated conditions were imminent and therefore the quality control of the work would not be possible. Also, water delivery for the Yala Season would be greatly affected causing uncertainties for the farmers.

The improvement works to the Inlet Canal was estimated and presented under nine Sub-Projects amounting to Rs: 18.0 million and these Sub-Projects were submitted to USAID for approval and establishing PILs. The works covered by the first two Sub-Projects were partially completed in December 1991 and the Consultant's O&M Engineer assisted the Chief of Party in the preparation of reimbursement claims based upon field inspections.

The Consultant prepared pragmatic guidelines on the design, construction and operation procedures of the improvements to the Inlet Canal for distribution among the TAs who were chiefly involved in the construction activities. Some of these guidelines are shown in Exhibit III-3.

6. Modifications to RBMC of Magallewewa.

The proposals to effect improvements and modifications to the RBMC were included in the ISMP scope of work during mid June 1990. The survey investigations and planning activities included in increasing the capacity of the canal to serve Stage III area downstream of the present irrigable area on the RBMC were completed by the ID personnel during 1990. These documents were then referred to the Director of Irrigation as the implementation of this sub-component was entrusted to another lending institution.

The above scope of work also included the investigation , design and construction of 12 km long feeder canal commencing from 23 km of the RBMC to augment the capacities of a series of minor tanks in the service area of Stage III. The survey and investigations for this 12 km extension were completed and the documents also were referred to the same lending institution for framing up proposals for implementation.

C. POLONNARUWA SCHEMES

In the Polonnaruwa Range, the Consultant was mainly responsible for providing guidance and assistance to the ID personnel in the preparation of the Annual Maintenance Plans and related Exhibits of the Main and Distributary Canal Components of Parakrama Samudra, Minneriya and Kaudulla Schemes.

The Consultant assisted the relevant personnel in organizing and conducting the Walk-Through Maintenance Surveys of all components of the systems. Brief instructions sessions were held at different locations to highlight the main features of the survey and in the preparation of related documents. All relevant formats were prepared by the Consultant and furnished to the TAs to enable them to expedite compilation of these documents.

Due to the systematic and continuous attention given by the Consultant, it was possible to obtain the first draft of these reports for the three Main Systems and the 81 Distributary Canal Systems in the three Schemes ter of 1991.

The reports pertaining to the three Main Systems were reviewed in detail by the Consultant and transmitted to the respective IEs for finalization and future implementation. Some suggestions were furnished by the Consultant to the IEs in order to assist them in the planning and implementation of the Preventive Maintenance Program in sustainable manner. These suggestions are given in Exhibit III-4

In fulfillment of one of the conditions of the "Irrigation Sector Assistance Agreement" between the GOSL and USAID, thirty Distributary Canal Systems had to be handed over to the respective DCOs for operation and maintenance purposes before the end of December 1991. Therefore, the Annual Maintenance Plans and Cost Estimates of 24 Distributary Canal Systems in the Polonnaruwa Range were reviewed by the Consultant for finalization in Sinhala by the TAs and for submission to the respective DCOs.

In addition to helping the ID prepare the Preventative Maintenance Program, the Consultant held a Training Program on Construction Supervision and Quality COntrol for TA's and WS's in July 1990. Exhibit III-5 presents the extent of this important Training Program.

14

CHAPTER IV

BALANCE OF WORK REQUIRED TO ACHIEVE ISMP GOALS.

The final phase of the Consultant's assignment had been limited to monitoring the preparation of Preventive Maintenance Programs for the rehabilitated systems as envisaged under the ISMP Project Paper. Therefore, the comments presented hereafter will reflect and be confined to the Preventive Maintenance Program only.

A. GAL OYA SYSTEMS

The schedules presented on Exhibit IV-1 show the status of the different Preventive Maintenance Program activities and the accomplishments that are expected to be achieved before the end of the Project on June 30,1992. Based upon the above schedules, the ID Field Staff is required to contribute a major effort in order to realize the objectives of the Preventive Maintenance Program.

The most important and difficult task is the preparation of the Blocking out Plans of the respective Distributary Canal Systems. This requires a considerable effort by the ID Field staff for carrying out the requisite field work and supported by the drafting personnel in the finalization of the updated BOPs. These updated BOPs will become an invaluable asset for the DCOs and ID personnel for improved systems O&M management.

In contrast to other ISMP Schemes, in the Gal Oya Systems there are well established Field Operation and Maintenance Units which have been quite dynamic and effective in carrying out the management activities. Therefore, the implementation of the Preventive Maintenance Programs in the Gal Oya RB and LB Systems should be initiated without too much difficulty based upon guidelines the suggestions furnished by the Consultant.

B. RIDI BENDI ELA SYSTEM

Three Field Operational Units of this Scheme became operational at the end of December 1991. Hence, the commencement of implementation of the Preventive Maintenance Programs of the Main and Distributary Canal Systems could be planned immediately.

In early 1992, the O&M responsibilities of three Distributary Canal Systems, namely the Ibbawala DCO, Centre Canal DCO and Balagollgama DCO will be handed over by the ID. Then the ID personnel will be required to facilitate

and assist these DCOs in the planning and resource mobilization processes so that the implementation of the Preventive Maintenance Programs can be accomplished satisfactorily.

The schedules presented on Exhibit IV-2 show the status of the different activities and accomplishments of the Preventive Maintenance Programs of the RBE Scheme as of December 31,1991.

The Preventive Maintenance Programs of the rest of the Distributary Canal Systems should be finalized in early 1992 and handed over to the respective DCOs when they take over O & M responsibilities.

The draft BOPs of the Distributary Canal Systems need to be updated by carrying out extensive field checks by the ID Field Staff with the participation of the respective Farmer Representatives of the DCOs to ensure that these plans will provide accurate and the most recent information in order to assist the DCOs in managing their Systems.

C. POLONNARUWA SYSTEMS.

The Preventive Maintenance Programs of the Main Systems for the four Schemes in the Polonnaruwa Range are available with the respective IEs. The cost allocation required for the implementation of these Preventive Maintenance Programs during 1992 has already been intimated to the authorities concerned for appropriation of the necessary financial resources.There is positive indication that the full requirement of funds will be available to carry out the Preventive Maintenance Programs. Therefore, the IEs of each Scheme should concentrate to strengthen of existing Field Operation and Maintenance Units and to expedite establishment of new units at the designated locations.

The maps and diagrams prepared by the Consultants for the Main System of the Giritale Scheme are shown in Exhibit IV-3.

Twenty seven Distributary Canal Organizations have agreed to take over their respective Distributary Canal Systems and operate and maintain the Systems commencing from early January 1992. The Preventive Maintenance Programs for each DCO will be submitted to these DCOs by the IEs at time of take-over. Therefore, the ID personnel should facilitate and assist the DCOs in initiating implementation process. The Preventive Maintenance Programs of the rest of the Distributary Canal Systems should be finalized by the ID personnel and made available to the DCOs when they take over the O&M responsibilities during 1992.

The BOP's of the Ditributary Canal Systems of Parakrama Samudra, Kaudulla and Minneriya Schemes have to be prepared using the latest available maps and plans by the respective ID Field staff. The finalized BOPs should be authenticated and handed over to the DCOs at the time of take-over of the Systems for O&M.

The reports and Exhibits pertaining to the balance of the Distributary Canal Systems have been handed over to the respective IEs in order to enable them to finalize these plans based upon the recommendations and guidelines furnished by the Consultant.

The maps and diagrams pertaining to the Puranagama Distributary Canal System of Giritale Scheme were prepared by the Consultants and are shown on Exhibit IV-4.

The status of the Preventative Maintenance Programs of the four Schemes in the Polonnaruwa Range as of December 31,1991 is shown on Exhibit IV-5.

The Annual Maintenance Costs required to implement the preventive maintenance of the ISMP Systems were developed and the Summary of these costs are given on Exhibit IV-6.

CHAPTER V

RECOMMENDATIONS AND LESSONS LEARNED FOR FUTURE APPLICATIONS

Pursuant to the approved implementation procedures of the ISMP, various evaluation and review sessions were held by the Consultant during the LOP to steer the Project personnel in the appropriate direction. As a result of these sessions, many adaptable remarks and recommendations have been furnished by several eminent personalities. Based upon these recommendations the application of corrective measures wherever deemed relevant were introduced into the Project to facilitate achievement of ISMP Goals. In addition, it was also possible for those who were close and who were sincerely following the growth and development of the Project to learn a few scintillating and invaluable lessons in the implementation of this extension-service oriented Project in different varying environments. Therefore, the Consultant would like to list some of the noteworthy lessons which may be considered in conjunction with other strategies for future applications.

However, the Consultant wishes to draw the attention of all those who are concerned with the implementation and impact of the ISMP to the Appendixes of this report where some of the specific impediments which caused various setbacks in the O&M activities were identified. Thereafter, procedures for resuscitation and corrective measures were synthesized by the ID and IMD personnel with the participation of the members of the Technical Assistance Team in order to resolve the problems.

1. PROJECT AWARENESS PROGRAM.

The main theme of the ISMP is changing the attitudes of all people involved in irrigated agriculture under the ISMP. To accomplish this, considerable investment in Institutional Development Activities and in the carrying out low-cost technological innovations to the physical facilities of the Irrigation Systems in order to enhance the overall water - use -efficiency and to boost the economic status of the beneficiaries. These concepts are unique under the ISMP as the majority of people are of the opinion that improvements and or rehabilitation of any irrigation system involves massive investment in infrastructural development.

Therefore, the Project concepts; the sequence of implementing procedures of different activities; the inter-relationship between the different components; roles and functions of several Agency Personnel; donor-recipient's conditionalities and obligations and allied matters should be very explicitly discussed at open forums to make all aware of the correct approach to be implemented under the Project.

It is unfortunate that the situation in the Country at the inception of the Project had been quite precarious with unpredictable condition which prohibited the gatherings and congregations of people in most of the systems. Therefore, this initial setback could have caused considerable confusion in vital aspects of Project implementation. The slow progress and lack of initiatives could have been corrected if continuous efforts were taken to conduct awareness programs for the benefit of the categories of personnel who were to be involved in the Project.It is unfortunate that field level officers were not given the overall objectives of the Project at the very beginning as their contribution to the Project was vital for its success. Therefore, in the future, it is very essential to remedy this situation at the very beginning of the Project in order to ensure its success and to justify the enormous efforts taken by the multitude of people involved.

2. PILOT PROJECT AREA.

As mentioned in the foregoing paragraphs, ISMP should have been considered primarily as an indirect approach for improving the quality of varieties of services required by the farmers for increasing agricultural productivity. Therefore, it should have been treated as an extension-service improvement exercise. Based upon this premise, a "Pilot Project" in each Scheme should have been developed by the ID and IMD personnel concerned in highlighting the different ISMP activities.

Demarcation of suitable and manageable sizes of Distributary Canal Systems which are acceptable to the beneficiaries and the ID and IMD personnel should have been the first and foremost activity. Once the Pilot Project Area was identified, suitable field level agency personnel, particularly from the ID, DA, IMD and LCD, should have been hand-picked and entrusted with the total responsibility of implementing project activities in the Pilot Area. Lessons and short term training sessions on interdisciplinary team approach for Irrigation Systems Management should have been given them to gain enough confidence to face the renewed challenges.

All logistical requirements for transportation, communication, convening meetings, and for residential purposes should have been provided by the respective implementing agencies to avoid frustration and dampening of enthusiasm. In addition, suitable "project accomplishment - allowance" should have been provided in order to compensate the personnel for the extra efforts made by them and they should have been paid in addition to the reimbursement of incidental and travelling expenses.

The formation of FCFO and DCFO should have been initiated in these Pilot Project Areas at the very beginning. With this initial setting, all other ISMP activities such as improvements to O & M services which are multidimensional and require experimentation by the Consultants, Client and implementing personnel should have been undertaken. Similarly , the Crop Diversification Program, Financial Management Improvement Program, Training Enhancement Programs for field level officers and farmers, and the Research Programs should have been launched and tested in these Pilot Project Areas for replication in other Distributary Canal Systems when conducive environment and conditions prevailed.

This approach would have facilitated efficient and effective propagation of all the innovations entailed in the ISMP. Therefore, it is the Consultant's considered opinion that the misconceptions which prevailed could be treated as invaluable lessons learned from the ISMP experience.

3. COST-EFFECTIVE REHABILITATION AND MODERNIZATION OF IRRIGATION SYSTEMS.

3.1 Walk-Through O&M Survey.

Cost of rehabilitation of the ISMP Systems have been considerably low in comparison with the investments made under the other contemporary projects. Besides, there have been some challenging technological innovations incorporated in the design and execution practices which were over-shadowed inadvertently by the majority of the implementing personnel.

The "Walk - Through Maintenance and Operation Survey" which is a diagnostic process was conceived as the lead activity in the Systems Rehabilitation under the ISMP. In addition, this survey would have been a wonderful opportunity to initiate Farmer-Officer Teamwork and to foster a better understanding between farmers and the personnel of IMD and ID. Unfortunately, this improved and appropriate methodology was not implemented early enough in many of the Systems in order to identify the rehabilitation requirements with the beneficiaries and to develop intimate knowledge of the system components; this would have been extremely helpful to the success of future irrigation system management.

Nevertheless, the Consultant wishes to state that for ensuring cost- effective rehabilitation and modernization of irrigation systems this walk-Through O&M approach the most effective method found to date. Therefore, all ID personnel have to redouble their efforts to reinstall this practice in Systems with necessary refinements.

20

3.2 SELECTION AND USE OF APPROPRIATE TECHNOLOGY FOR SYSTEM REHABILITATION.

Based on the Walk-Through Maintenance and Operation Surveys, appropriate proposals have to be framed up in consultation with the DCOs and confoming to cost limitations. At times, detail survey and investigation are done to ensure accuracy and adaptability to the related technical requirements of the work. All these exercises are carried out to ensure strength, stability and cost effectiveness.

In order to accomplish the appropriate rehabilitation many man months of technical and engineering input is required. Therefore, the use of typical drawings which were developed on hypothetical situations is very demanding requirement of the process in order to accelerate the work. This practice of using standard and typical drawings would have been more effective it the required second line checking and supervision was strictly enforced as defined in the departmental procedures.

Unfortunately, due to lack of checking and supervision there are obvious flaws in the selection and adoption of proposals for rehabilitation in certain cases. This could have been avoided and considerable reduction in the overall cost of some structure could have been made.

In development projects funded by donor agencies, it is often found that people attempt to be progress conscious at the expense of cost and quality. Therefore, there should have been scheduled refresher courses conducted by the respective Range staff where action plans could have been developed and followed in the process of improving rehabilitation proposals.

In addition, this situation could have been partially remedied if the command areas were suitably zoned and the TAs were made responsible for all O&M activities from the inception to the completion under those command areas. Therefore, it seems that there is a necessity for micro level planning in Projects of this magnitude and importance.

3.3 QUALITY CONTROL AND PROGRESS MONITORING

Cost-effectiveness has to be considered in a wider perspective and should include all ancillary expenditures which would be required to fulfil the functionality of the rehabilitation process upto the proposed economic life span of the system. The routine O&M costs and the longevity of the rehabilitated structural components have to be taken into careful consideration. Also ,the prioritization of the

rehabilitation items and timeliness of completing different tasks to ensure outflow of Project benefits are other factors which should be considered to determine the true cost effectiveness of facility.

The above postulations demand demonstrated abilities among agency personnel and the contractors together with the adequate resources and avenues for installing effective and appropriate quality control and progress monitoring strategies. Therefore, it can be deduced that the above task must be given specific consideration by all level of agency personnel right from the inception.

4. IMPLEMENTATION OF ESI/PR WORKS

In all systems, the rehabilitational works are widely dispersed and multifarious.Respect for early commencement and expeditious completion of ESI/PR works at each and every locations is understandable. The complaints about procedural delays in approving proposals, selection of appropriate construction agency and awarding construction contracts are many. Despite the various impediments prevailing in each Range, relatively high intensity of construction activities were annually implemented under the ISMP with the resources and connections available in ID.

In consonance with the GOSL revised policy on "Participatory Management" and in accordance with the approved ISMP implementation strategies,. both private agencies and NGOs such as DCOs, RDSs and other FOs undertake construction works. Complaints about preferential treatments in providing needed technical services, recommending bills of payment and release of funds for payment are not uncommon in all the systems.

On closer scrutiny of these issues, quite startling revelations were found. Though many of them were highlighted sporadically at different occasions and in memorandums and or meetings, it is disheartening to note that no effort was taken to resolve these compelling and demoralizing conflicts. However, it is fervently hoped that the on-going research study on "Cost-Effective Irrigation Modernization Strategies for the 1990s" would alert the personnel concerned who are in positions to evolve probable solutions.

Nevertheless, the Consultant wishes to offer some suggestions to revive the current construction practices to ensure good economic return from the rehabilitation processes. These suggestions are shown in Exhibit V-I.

5. CONSTRUCTION CONTRACTS BY PRIVATE CONTRACTORS AND NGOs.

Contract method of execution of construction works was introduced in the Irrigation Department during late 1970s to relieve the professional and para professional staff from the administrative nature of work in order to enable them to enhance the technical input in the investigation, design,planning and quality control supervision of the construction items. Hence, there had been good demand for construction agencies to undertake construction activities in the several irrigation development projects. Many individuals and organizations were enrolled as Registered/ Authorized contractors of the Irrigation Department after proving their financial worthiness and track record in this venture.

Many of them proved their capabilities by executing important works to the entire satisfaction of the officials and beneficiaries within the target time and cost. However, this trend has changed completely during the past few years. Many difficulties and shortcomings are encountered in the contractual procedures .

Majority of these impediments are due to lack of knowledge of the actual obligations of the parties to the contract; incompetency in contract management; insufficient financial and material resources; bureaucratic bunglings; expectation of unrealistic profit margin; overtly and covertly involvement of bureaucracy and policy makers with contractors; lack of direct inducements for the officials to work for long period in rural environments; and absence of civic-mindedness among most of the people who are directly involved in contract activities.

Poor quality of work due to noncompliance with technical specifications of supplies and services are evident in most of the systems. Undue delays in completing the executions are experienced at several locations. Because of this, there are difficulties in project management and the beneficiaries react negatively towards the contractors and officials.

These lapses and detrimental effects are quite often found in small and medium scale contracts. The method of awarding this types of contracts influences a lot of malpractice which is the root cause for all the problems. There is no requirement for the contractors to employ competent technical personnel in contract management.

The position of NGOs in this sphere of activity in many instances is different than that of the private agencies. All the NGOs have the privilege of obtaining contracts at the engineers estimated costs. However, the overall expectations are not fulfilled.

The Executive Committee Members are burdened with the entire operations including funds mobilization. There are instances where the contracts are sub-let to private parties to save the image of the NGOs.

The main objective of entrusting construction contracts to NGOs of the Scheme is very seldom realized due to several reasons. Participation of the beneficiaries are limited. The NGOs also do not display flexibility in execution of works by attending to unspecified but essential small scale work in the vicinity of the working areas. Even, there are specific instances where quality and quantity of works are manipulated to enhance profit margin.

The success of implementation is mainly dependant upon the technical services provided by the FAs and WSs and assistance rendered by them in the overall management process.

Since this practice had been tested in many systems of the ISMP during the past four years and the performances are not remarkable and the objectives are not achieved, it leads to the conclusion that the small scale construction contract procedures both by the private agencies and NGOs need to be reviewed in order to remove the negative aspects available in the existing procedures.

6. CERTIFICATION OF COMPETED WORKS.

The O&M Engineers are required to inspect the completed ESI/ PR works as expeditiously as possible and prepare certificate for reimbursement from the donor, USAID. This involves extensive field checks and many man months of computer works. The success of this task is very much dependent upon the promptness and commitment of the contractors to complete the works in full and of the ability of the ID staff to monitor this activity systematically in order to enable the Consultant to program field visits economically and usefully. In the ISMP, this was paid scant attention by most of the ID staff due to lack of understanding of the processes.

In addition, the ID staff attempted to make use of the Consultant inspection certifications to make final payments to the contractors. This is absolutely an inappropriate procedure as the Consultant's visits do not guarantee the quantity and quality of work executed. Therefore, in future Project works there should be improved practice adopted in this process.

7. USE OF COMPUTERS AND EQUIPMENTS IN THE PROJECT ACTIVITIES.

Many computers were procured and installed in all the ISMP Schemes of the Irrigation Department in order to facilitate the many aspects of Project implementation. Several officers were provided with intensive training courses in computer programming and use of several software in USA. However, it is unfortunate that attempts were not made in many offices (other than DDI/ Kurunegala) to make use of these trained experts and the expensive and effective supplies in the routine functions of the Project.

Therefore, it is necessary to monitor the use of these supplies by donors and by senior ID staff in future Project activities.

Similarly, there were some simple equipments, tools and pocket calculators provided to facilitate good quality control and other water management activities. Majority of these supplies are under-utilized at present. Therefore, proper attention should be made when these supplies are procured and made available free of charge.

APPENDICES

SCOPE OF WORK - SENIOR OPERATION AND MAINTENANCE ENGINEER

The Scope of Work required for the Senior O&M Engineer in Ampara Range is outlined below:

A. REHABILITATION OF RIGHT BANK MAIN CANAL RBMC

- o Assist the ID in the Surveys, Planning and Design of rehabilitation works.
- o Review plans, designs, estimates and costs of rehabilitation work and assist the SAI Expatriate O&M Engineer in the final approval of drawings for construction.
- o Assist ID in the Cconstruction, Pprogramming, Supervision and Quality Control.
- o Monitor Construction Schedule, Progress and Cost.
- o Inspect the work upon completion and assist the expatriate O&M Engineer in the Certification of Completion for USAID reimbursement.
- o Develop and work with training staff to present a course in construction supervision and quality control and any other training activity related to O&M as requested by the ID./IMD.

B. MAINTENANCE PLANS FOR RBMC.

- o Assist ID in developing annual maintenance plans for RBMC.
- o Assist ID in preparing Priority Maintenance Plan during Life-of-Project.
- o Assist ID in preparing Preventative Maintenance Program after Life-of-Project.
- o Assist ID in training staff in maintenance.
- o Review existing O&M Manuals and up-date maintenance manuals to reflect preventative maintenance program after Life-of-Project.
- o Prepare a report summarizing experience on maintenance program for the RBMC.

C. ANNUAL PREVENTATIVE MAINTENANCE PLAN LBMC

- o Examine present maintenance procedures, identify weaknesses, propose changes, recommend staff levels, schedules of maintenance, procedures, equipment etc, felt necessary for carrying out preventative maintenance program.
- o Develop and recommend refinements to GSL annual budget procedures for ID and procedures which utilize supplemental SL/USAID maintenance funds.
- o Assist in preparing a preventative maintenance manual and train field staff on implementation of preventative maintenance program.
- o Assist ID to implement preventative maintenance.
- o Prepare a report summarizing experience of the preventative maintenance program and analyze the progress of the program during the Life-of-Project.

D. WATER MANAGEMENT IMPROVEMENTS FOR RBMC

- o Assist ID in the establishment of water measurement structures including discharge rating calibration.
- o Assist ID in measurement of losses in conveyance distribution and on-farm system.
- o Assist in developing on-farm water requirements for paddy and O.F.C.
- o Analyze data and make recommendations for improvements in operation procedures and on-farm practices and prepare a report on findings and recommendations.
- o Assist ID in preparation of Seasonal Water Report.
- o Assist SAI Water Management Specialist and Computer Modeling Specialist in developing a computer model for scheduling and recording, water releases for RBMC.

REVIEW SESSION ON QUALITY CONTROL - AMPARA RANGE
MARCH 1990

" TRAINING IS LEARNING TO CHANGE THE PERFORMANCE OF THE PEOPLE DOING THE JOB FOR THE ORGANIZATION ".

COURSE OBJECTIVES

- TO REVIEW FUNDAMENTALS IN PREPARATION AND PLANNING CONSTRUCTION.
- TO IMPROVE METHODS OF PROGRESS CONTROL,
- TO DISCUSS ADAPTABLE QUALITY CONTROL METHODS.
- TO DEVELOP METHODS TO COMPLETE WORKS WITHIN THE ESTIMATE AND PERIOD
- TO EMPHASIZE THE IMPORTANCE OF COMPLETING WORKS IN WORKMANLIKE PRACTICES.
- TO DEVELOP METHODS TO MAINTAIN UNIFORM STANDARD CONSTRUCTION MANAGEMENT PRACTICES.
- TO REVIEW CONTRACT MANAGEMENT PRACTICES IN THE PRESENT CONDITION.
- TO DISCUSS ISMP MID TERM EVALUATION RECOMMENDATIONS AND THEIR APPLICABILITY IN GOS.

IDENTIFIED PROBLEMS AND POSSIBLE SOLUTIONS

1. BORROW AREA CONDITION

TAA pointed out that in several occasions, location of borrow area is not notified in advance to an unanimously agreed that in future borrow area is selected by the TA of the site for the contractor and any deficiency arising out in condition of borrow area material, will be the responsibility of the TA concerned. The borrow area should be used without causing environmental harzads.

2. FILLING AROUND STRUCTURES.

It has been generally agreed by all the TAA that the earthwork and turfing to be done flush with the surface of the structural component and well consolidated.

3. POOR COMPACTION

It was agreed that before starting the work, compacting machine and hand compactors to be given in charge of the labour supervisor at site to direct the compaction and shall be held responsible for the correct compaction and a record to be maintained as to the machine hours worked.

4. LOPES FOR EARTH WORK

All TAA decided to use peg and string to fix design slope and Iron Templates supplied by the Department are available at site to check the slopes. A sample section about 5 to 10 meters will be done by the contractor under the direct supervision of the TA concerned.

5. CUTTING EMBANKMENT FOR CONSTRUCTION OF STRUCTURES

All agreed that the excavation of trench for foundation of structure across existing bund shall be followed as below:

a. Where there is only one lane traffic is possible, vertical cutting in the platform could be allowed. In all other cases, the excavation shall be done to 2.1 slope (2 vertical and 1 horizontal) allowing enough space to set out foundation.

6. SILT DISPOSAL

All TAA agreed that the silt or loose materials cleared from the canal shall at once be taken and deposited on the D/S slope of the bund and not intermediate depositing and subsequent removal shall be permitted. TA shall be held responsible for the above action. All previous lapses shall be rectified immediately.

7. TOP SOIL REMOVAL

All TAA agreed that the TA and WS shall be held fully responsible for the removal of top soil before earth filling is commenced.

8. WETTING AREA / ADEQUATE WATER FOR EARTH WORK.

It was unanimously agreed by TAA that the borrow area shall be wetted in all cases in advance, at least 24 hours earlier to borrow. Under exceptional circumstances, where water cannot be transported immediately to the borrow areas, watering and consolidation at embankment will be permitted on special request to IE. TA shall be held responsible for any laps on the above agreement.

9. TURFING

It was decided by all TAA to do a sample section of strip turfing by the contractor under the supervision of the TA. In this, thickness of turf, preparation of surface and pegging will be more emphasized.

10. BACKFILLING WEEP HOLES, FILTER ARRANGEMENTS & FILL MATERIALS

All TAA agreed that weep holes and filter arrangements will be checked by IE before the back fill.

11. CONCRETE

a. Lapping Formwork and Struts for Formwork

In view of the poor quality of planks and struts used at present, DI would instruct contractors to use steel plates and shuttering boards made out of 1 1/4" thick good quality planks as all the contractors have under taken several work sites. In case, the contractors show reluctance, DDI would seek DIs permission to issue steel shutters.

b. Checking Reinforcements

design - IEE shall also inspect all reinforcement details before the commencement of concreting.

c. Improper Appearance and Striking off Formwork

Concreting shall be done in the presence of TAA and either TA or WS shall be present at site when formworks are struck off in order to treat the surfaces to give proper appearance.

12. CONTRACT MANAGEMENT

TAA shall prepare realistic construction program in consultation with the contractors after visiting the sites. Copies of these programs shall be made available to IE Ampara and SAI Office for monitoring purpose, within a fortnight from the date of agreements.

Also, construction programs for the works in progress shall be prepared and made available to the above parties immediately.

If the contractors fail to adhere to the above programs, TA expected to notify IE Ampara for necessary action.

SAI shall monitor the progress of work and check quality of different works using the Construction Monitoring Format (Copy is annexed) and communicate with IE Ampara through the Divisional Assistant. TAA are expected to use the TAs special report format to seek clarification and advice from superiors.

TAA shall establish identification marks of all the existing structures and new structures to facilitate field inspection. This item of work should be given the highest priority as emphasized by DDI.

All TAA shall constantly activate the contractors to complete their respective works as early as possible. Regarding supply of stores to private contracts for works undertaken by them on agreements signed later than 31/5/1990. DDI agreed to appeal to D.I.

13 GENERAL

a. When earth excavation or related works are required for modification and improvement works of the existing structures, extra care has to be taken to attend such works. When, in doubt, advise and instructions should be sought from Engineers.

b. All works should be executed in such a manner that the new works are matching in all respects with the existing structures in the channel system.

c. All workmen shall be properly guided when works are executed so that they could acquire skills and enhance their capacity gradually. Similarly, all TA and WSS shall develop attitude to adopt the engineering principles very strictly and they shall take all endeavors to improve their capability systematically. At the end of the life of the project, their standard should be an unquestionalbe level.

d. All pragmatic rehabilitation works and preventative maintenance works shall be carried out to the entire satisfaction of policy makers. (Ministry, USAID) public (Farmers) and system operators (IEE, TAA, WSS & Irrigators).

SHELADIA ASSOCIATES, I.N.C., AMPARA
CONSTRUCTION MONITORING FORMAT

Name of Work :

Name of I.A :

Name of Contractor :

Sub-Proj. No.	Location	Description of Work	Progress	Observations

Signature :

Date :

Name of Inspecting Officer:

T.A.'s SPECIAL REPORT ON CONSTRUCTION

SCHEME
UNIT

AGREEMENT NO :
CONTRACTOR :
T.A.'S NAME :
DATE OF REPORT :

Date	Location	Type of Problem	Proposed Action

OPERATIONAL ACTIVITIES OF RBE
SYSTEMS OPERATIONS RBE

Exhibit III-2
Sheet 1 of 3

No.	SUB TASKS	RESP PERSON/ ORG N	JAN 01/31	FEB 01/28	MAR 01/31	APR 01/40	MAY 01/31	JUN 01/30	JUL 01/31	AUG 01/31	SEP 01/30	OCT 01/31	NOV 01/30	DEC 01/31
2.2	IMPROVEMENT TO IRRIGATION SYSTEMS OPERATIONS													
	RIDI BENDI ELA SCHEME (5,553 Acs)													
2.2.1	INSTALLATION OF MEASURING DEVICES/GAUGES(96 LOCATIONS)	ID	100											
2.2.2	CALIBRATION OF MEASURING DEVICES/GAUGES(96 LOCATIONS)	ID	50	75	50	100								
2.2.3	ASSESSMENT OF CANAL LOSSES (18 M-NODES)	ID	0	30	75	100								
2.2.4	UPDATING ISSUE TREES	ID	100											
2.2.5	DEPLOYMENT OF MONITORING PERSONNEL (4 TAs, 4 WSs, 5 PLs)	ID	100											
2.2.6	IMPLEMENTATION OF COMPUTER ASSISTED SYSTEM OPERATIONS	ID	0	50	75	100								
2.2.7	UPDATING SYSTEM DATA AND REFINEMENT OF OPERATIONS	ID	0	5	15	25	35	40	45					50
2.2.8	PREPARATION OF SEASONAL WATER REPORTS .	ID												
	I. MAHA SEASON 1991-92		0		0	100								
	II. YALA SEASON 1992		0								0	100		
2.2.9	PREPARATION OF RESERVOIR OPERATIONS SEASONAL PLANS	ID												
	I. MAHA SEASON 1991-92		0		0	100								
	II. YALA SEASON 1992		0								0	100		

AWPT2S0

Irrigation Systems Management Project: Computer Assisted Systems Operation Model.

Based upon the "Revised Amplified Project Description" the use of "Computer Assisted Systems Operation Model" developed by the 'TAT' would be expected in use all ISMP systems to ensure effective water management. Therefore the following guiding principles will be adopted for discharge measurements within an irrigation system.

The total net quantity of water delivered to each DCO for every season will be computed by measuring discharges at the DCO boundary nodes and at other prominent inflow and outflow nodes. The net quantity consumed by each DCO could be computed based upon these measurements.

The quantity of water delivered to each DCO during each issue should be adequate to meet the crop water requirements and acceptable to the DCO management. To ascertain this condition, it is important to evaluate the flow rates experienced in the canals during the past seasons from the water level marks reflected in the canal structures. The flow rates corresponding to these levels will be computed or measurements could be made using portable devices such as current meters and calibrated cut throat flumes taking into account the actual water requirements.

1 Based upon the irrigation methods adopted, compute the theoretical irrigation demand required for the command area of each canals. Allowing reasonable conveyance efficiencies (losses) for the conveyance systems, obtain the gross demand at the point of measurement/calibration and try to compromise for the actual discharge that is expected to be maintained.

2 Discharges in all FCs irrigating more than 9 ha will be measured under normal operation conditions. These discharges will be fed into the computer operation model to obtain the Water Management Index which would be the primary yardstick to assess the Water Use Efficiency in each canals.

3 Discharge in all other minor field canals (FCs irrigating less than 9 ha) will be measured under normal operating conditions only once. These information too will be entered in the "Computer Assisted Systems Operation Model" assuming the gate is open fully and maximum discharge inputed into the model when ever the canal is flown.

4 Any further discharge measurements in the Main Canals and Branch Canals will be carriedout under special circumstances. However, if any DCO management requires additional discharge measurements to facilitate equitable and reliable distribution of water these requests should be accommodated and as when time and facilities are available. But these information should not be used in the Computer Assisted Operation Model.

Example:

Let us consider the FC 1 of LB/RBMC

Command area = 66 ha
Length of the canal = 1200 m
Condition of the canal: The initial reach is in poor state and a lot of water is wasted. Desilting is required from the T.O to the first drop structure.

Crop grown - 135/105 paddy

Irrigation method - Rotational issue - 75 mm for 7 days
Irrigation period 3 - 5 days

Therefore the flow rate to be maintained in this canal could be computed as follows:

$0.036 \times Q \times 7 = A \times D$

When T 72 hrs

$Q = 66 \times 7.5 / 0.036 \times 72$ ls

A = 66 Ha
D = 7.50cm
T = 3 & 5 days=72 & 120 hrs
Q = flow rate through FTOs

Q = 191 l/s (=6.7 cfs)

When T 120 hrs
Q = 115 l/s (=4.04 cfs)

Assuming the conveyance efficiency as 75% Q72 = 254 l/s(=9cfs)
Q120 =153 l/s
=(5.41cfs)

Therefore, the canal discharge would vary from 254 l/s to 153 l/s when the duration of canal flow is varied from 3 days to 5 days.

Now let us consider the actual field operations during the past seasons. The water level marks reflected in the retaining walls d/s of the turnout structure have to be taken into consideration assuming this corresponds to the actual water requirement needs of the PCO. The theoretical calculations shown above do not reflect the field operational constraints. Therefore the discharge in the canal corresponding to this level has to be computed or actual measurement has to be carried out by regulating the turnout gate to deliver water at the water marks.

Then evaluate the flow rates and arrive at the compromising rate as the selection of flow measuring devices would be mainly dependant upon the range of flow rates. This is very important for flumes.

SYSCOMPU.SB

RBE_INLET_CANAL_DESIGN_PRINCIPLES

The original design capacity of this canal is 100 cfs (2.83 M^3/s). There are four important structures in this canal which prevent higher capacities without modifications to these structures. They are the:

i bridge at Ella along Anuradhapura road
ii 1st siphon at 3+750 km
iii 2nd siphon at 8+000 km
iv 3rd siphon at 11+320 km

Since modification of these structures would interrupt severely the cultivation seasons along with other inconveniences to communities, improving the canal profile to ensure frequent augmentation of Magallewawa is taken as the primary objective of this project.

The designed full supply depth and the bed slope of the canals also cannot be changed due to the above said reasons. Therefore, the only parameters which could be altered to assure regular/constant discharge are the cross sectional area and the roughness factor (N).

Since the full supply depth is fixed, the cross sectional area can be increased by widening only. Again, widening is restricted due to topographical features. Under these circumstances, different cross sections with portable 'N' values were selected for design purposes. The 'N' values are expected to change gradually in this type of canals as regular maintenance is not generally done. Therefore, the cross sectional areas are determined to match the lower and upper values of 'N'.

'N' can be increased from the accepted value of 0.025 of new earthen canal to 0.015, 0.018, 0.02 by lining the profile with concrete, plastered-rubble pitching, and plastered pitching respectively. However, due to cost limitations, quality control of pitching works and related reasons the choice was made to adopt an unplastered rubble pitching which would provide N values between 0.02 - 0.025 depending on the workmanship or smoothness attained. However we do not expect very smooth surface. Therefore, a value of 0.025 is justified for the fully pitched canal profile.

Similarly different ranges of 'N' values were assigned for different profiles as shown in the calculation.

Flow measurements were carried out in the different canal reaches and the 'N' values were checked. They are:

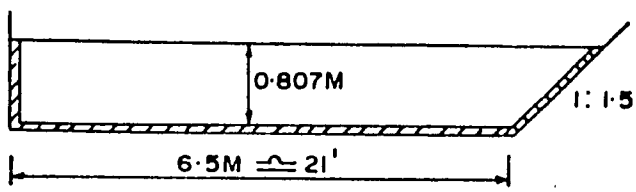
N = 0.03 - fully pitched section in the first kilometre reach
N = 0.03 - 0.035 - for section with LB pitching in the 2nd km
N = 0.035 - 0.04 - For earthen canal (unclean status)

Therefore, it is expected that the improvements to be done would reduce the N values to Ø.Ø2, Ø.Ø25, Ø.Ø35 for the above three conditions. This was to be tested by carrying out flow measurement exercises once the first kilometre of the canal is improved.

Another aspect considered in the design is the erodibility of the RB canal due to bathing and cattle trespass and surface runoff. Therefore, the side pitching would restrict this considerably.

The most critical reach of the canal is the section from the 1st syphon to the bridge at Anuradhapura road. Since the bridge at Anuradhapura road is a flume which functions fairly effectively, the discharge through the syphon should be improved to ensure that there is no back water effects from the syphon.

(i) Full pitching



A = 5.733 M^2 FSD = Ø.8Ø7 M = 2.65 feet
P = 8.758 M
V = 1/N x R^2/3 x s^1/2; s = Ø.ØØØ26

N = Ø.Ø2 V = Ø.6Ø3 m/s = 1.978 ft./sec
V = Ø.84 d^Ø.64 = Ø.84x(Ø.8Ø7 x 3.28)^Ø.64 ft./sec
= 1.567 ft./sec

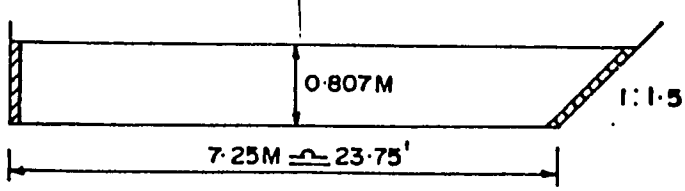
V/VC = 1.978/1.567 = 1.26 o/c

Q = 5.733 x Ø.6Ø3 M 3/s = 3.45 M^3/s = 122 cfs
N = Ø.Ø25; V = Ø.482 m/s = 1.58 ft./s
V = 1.58Ø/1.567 = 1.Ø - o/k
Q = 2.77 M^3/s = 97.7Ø cfs

N varies from Ø.Ø2 - Ø.Ø25, Q varies from 122 - 98 cfs

---

ii PARTIAL PITCHING - ONLY BOTH SIDES ARE PITCHED



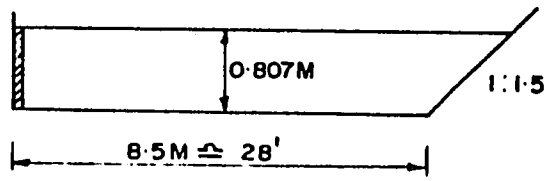
A = 6.338 M^2
P = 9.5Ø8 M
V = 1/N R^2/3.s^1/2
N = Ø.Ø25 V = Ø.488 m/s = 1.6Ø ft./sec

V = 1.60/1.567 = 1.02 o/k
Q = 6.338 x 0.488 = 3.09 M^3/s = 109 cfs. o/k

N = 0.03 V = 0.407 m/3 ; Q = 0.407 x 6.338 m^3/s = 91 cfs; o/k.
V = 0.85 o/k

N = varies from 0.025 - 0.03; Q varies from 109 - 91 cfs

iii ONE SIDE PITCHING



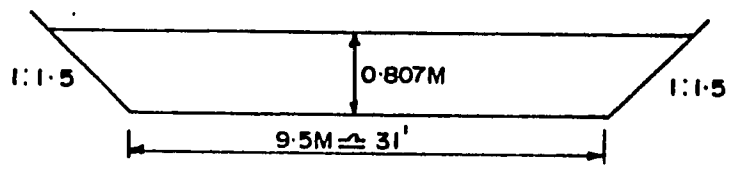
A = 7.347M^2; P = 10.758M

N 0.03 - V = 0.413 m/s; Q = 3.04 m^3/s = 107 cfs.
V/Vc = 0.864
N = 0.035 V = 0.0354 m/s Q = 2.60 m^3/s = 92 ft.
V/VC = 0.74

N = 0.032-V = 0.3875 m/s; Q = 2.83 m^3/s =100 cfs.
V/Vc = 0.811 o/k.

.: BW = 8.5m is o/k.

iv



A = 8.642 Mm^2; P = 11.76 m

N = 0.035; V = 0.372 m/s; Q = 3.21 m^3/s = 113 cfs; V/Vc=0.78

N = 0.04; V = 0.325 m/s; Q = 2.80 m^3/s = 99.1 cfs; V/Vc=0.68

If widening is feasible, the minimum width of bed is to be 9.50m.

Note: The N values would increase from lower values over a period of time due to accumulation of debris along with growth of weeds. As usual, anticipating no proper maintenance, the discharge of approximately 100 cfs is generally assured with non- silting and non- eroding conditions.

RBE - INLET CANAL - SETTING OUT AND QUALITY CONTROL SUPERVISION PROCEDURES.

i Study the plans well and understand the details

ii When the canal is closed, take fresh set of levels and check the correctness of the informations given in the plans.

iii If the details are correct, check the quantity sheets to ascertain that the proposals shown in the plans and quantities provided are matching. You should remember the basic design principles always.

iv If the details given in the plans tally with the quantities provided in the estimates, you could proceed to set out works. Before setting out, you could make sketches in an exercise book which should be with you always when you are at the site.

v If the details given in the plans differ from the site conditions you should take action to prepare a fresh plan for construction which should be approved by DDI or by an authorized officer.

vi When excavation is in progress, monitoring/check very closely the type of materials encountered, the slope and bed grade maintained, width and depth of cut etc. as any erroneous excavation would be costly and irreversible.

If there appears to be any major deviation, action should be taken to make changes in consultation with the IE/DDI.

vii You should keep in mind that irrigation works need flexibility to suit the ground conditions as most of the works are constructed on the ground. Therefore, continuous and serious supervision would be very essential.

RBENCDP.sb

RBE/ISMP
20-02-1991

Eng. H. P. S. Somasiri,
DDI/Kurunegala

Sub: Rehabilitation of RBE system under ISMP.
Improvements to Anicut and Inlet Canal.

Dear Mr. Somasiri,

This is to request you to look into the following matters at your earliest convenience as water issues for the ongoing maha season would be terminated on 25-2-1991 and the Inlet canal could be closed for commencing construction works.

1. Since the proposal to raise the anicut crest level should have the written approval of the Director of Irrigation, it is suggested that suitable action is pursued early with regard to this matter.

   Also, approval of the USAID with the PIL numbers for the different Sub-projects needs to be obtained to commence work in the Inlet Canal.

2. The plans and estimates for improvement works of the flank bunds have not been made available for the Consultants' review yet. Since the raising the crest level and updating the flank bund works have to carried out simultaneously, due consideration has to be given to get the proposals expedited.

3. Removal of trees from canal banks.
Since some of the trees may have to be removed when canal banks are widened, it would be better to identify these trees well in time and institute necessary action with the relevant authorised so that logging and related matters are made legally valid.

4. Canal alignment and setting out.
Since there had been considerable discrepancies in some of the levels given in the L.S & C.SS plans due to the difficulties caused by the flowing water during surveying and levelling works, it is suggested that fresh levels are taken in each cross sections using the same bench marks before commencement of work. These new level should be used for the computation of earth work in canal embankment.

5. Disposal of excavated earth.
Large volume of excavated earth has to be disposed suitably to prevent re-entry into the canal. Therefore, it is necessary that details of disposals are worked out by the T.As well in time and sketches showing the locations for disposals for every 100 meter sections ate made available to the construction agency and supervising staff for implementation.

Annual Maintenance Plans and Costs Estimates for Main System Components

The following format is recommended for the preparation of the above report of ISMP Systems.

1. History of the scheme with a brief description of the cultivation practices and related social, cultural and economic aspects. You have to state about the status of system and any rehabilitation and modernization works which were effected prior to the ISMP.

2. Introduction and Objectives of Annual Maintenance Plans.

   (Sample of Giritale scheme prepared by the Consultant is enclosed for reference and to prepare similar synopsis for your system.)

3. Scope of work under the Main System Components Maintenance Plans.

   (Giritale scheme sample is enclosed for reference). Please mention about the different sub-components of the Main System giving length of each of them.

4. Annual Maintenance Plan Estimating Criteria for different components.

   These criteria will be common for the ISMP Systems. Please attach good prints.

5. Walk Through Maintenance Survey.

   In this section, please outline the procedures adopted by the T.As and others in conducting the Walk Through Maintenance Survey. Please refer the sample attached.

6. Annual Maintenance Plan.

   Describe the purpose and use of the Annual Maintenance Plan and the details given in it. Also please mention how it could be used more effectively in the maintenance of irrigation systems.

7. Annual Maintenance Plan Quantity Estimates.

   Describe very briefly how the Bill of Quantities for the different items of maintenance works are prepared. Also, please mention the fact that the criteria used would be reviewed annually and refined.

8. Annual Maintenance Cost

This section is common for all ISMP Systems. However, the text has to be drafted to suit your system and the Table VII-5 is to be prepared using the Estimated Costs. The Cost Estimates have to be attached.

9. Maintenance Diagram

The text is to be modified to suit your system. The plans prepared by the Consultant need to be up-dated by carrying out field checks.

10. Schematic Water Distribution Diagrams

The text attached is for the Giritale System which has to be modified to suit your system. The Diagram has to be prepared using standard conventions. Please refer one of the diagrams prepared by the Consultants for the Giritale System.

11. Location of D.C.Os Areas for Operation and Maintenance

Please prepare tables based upon the details obtained during the Walk. Through Maintenance Surveys of the D.C.Os.

12. Conclusions and Recommendations

In this section, please highlight the implications of the cost of maintenance and related matters. However, emphasis should be given to the implementation aspects. Some suggestions are attached for developing appropriate strategies.

IMPLEMENTATION OF MAINTENANCE PLAN

-AN EFFECTIVE AND EFFICIENT ORGANIZATION IS A PRIMARY REQUIREMENT FOR THE SUCCESSFUL IMPLEMENTATION

-RANGE LEVEL, DIVISIONAL LEVEL AND PROJECT LEVEL ORGANIZATIONS HAVE TO BE INSTALLED

RANGE LEVEL RESPONSIBILITIES

-O & M ACTIVITIES HAVE TO BE THE RESPONSIBILITIES OF SEPARATE AND DISTINCT OFFICIALS

-SELECTING AND PLACING OF APPROPRIATE O & M STAFF IN THE RANGE LEVEL AND DIVISIONAL LEVEL

-PROVIDING RELEVANT JOB DESCRIPTION FOR ALL O & M STAFF

-ASSISTING THE PROJECT LLVEL O & M STAFF IN THE ESTABLISHMENT OF O & M FIELD UNITS

-LOCATIONS OF FIELD UNITS SHOULD BE ACCEPTABLE TO THE MANAGEMENT STAFF, PUBLIC AND POLICY MAKERS

-PROVIDING FINANCIAL ALLOCATIONS AND OTHER RESOURCES SOUGHT BY THE DIVISIONAL LEVEL PERSONNEL

-COMMITMENT TO CARRY OUT EFFECTIVE SUPERVISION OF IMPLEMENTATION OF PREVENTATIVE MAINTENANCE WORKS

TO

-COMMITMENT SUPPORT AND MOTIVATE THE PROJECT LEVEL STAFF IN THE PROPER IMPLEMENTATION

-EFFECTING PERIODIC INSPECTIONS

-RESOLVING PROBLEMS REFERRED BY THE DIVISIONAL/FIELD UNIT STAFF PROMPTLY

-PROVIDING APPROPRIATE TRAINING COURSES TO ENHANCE THE QUALITY OF MAINTENANCE SERVICES RENDERED BY THE FIELD UNITS.

-RECOGNIZING THE MAINTENANCE SERVICE IN PAR WITH OTHER ACTIVITIES OF THE DEPARTMENT TO INDUCE THE MAINTENANCE PERSONNEL TO REMAIN IN IRRIGATION SYSTEMS AT LEAST FOR TWO YEARS

PROJECT LEVEL RESPONSIBILITIES

-ACCEPTING MAINTENANCE SERVICE RESPONSIBILITIES WITH GREAT ENTHUSIASM

-FAMILIARIZATION OF THE COMMAND AREA WITHIN SHORTEST POSSIBLE TIME

-GATHERING INTIMATE KNOWLEDGE OF THE MAIN SYSTEM COMPONENTS

-REQUISITIONING ESSENTIAL TOOLS AND EQUIPMENTS

-RECRUITING CAPABLE AND EFFICIENT MAINTENANCE CREW FOR DIFFERENT ACTIVITIES AND PLACING THEM AT STRATEGIC LOCATIONS

-UPDATING O & M DATA

-LOCATING RESOURCE CENTERS SUCH AS METAL QUARRIES/SAND PITS AND MECHANICAL UNITS

-IDENTIFICATION OF READILY AVAILABLE SKILLED WORKMEN WITHIN THE COMMAND AREA

-REGULAR FIELD INSPECTION OF PROJECT AREA

-REASONS FOR MAJOR DEVIATIONS FROM THE PROGRAMED TARGETS HAVE TO BE FOUND IN CONSULTATION WITH THE EMPLOYEES/PERSONNEL RESPONSIBLE

-USE OF "MONTHLY PROGRESS AND COST RECORDS" WHICH IS A VERY GOOD TOOL TO MONITOR O & M ACTIVITIES SHOULD BE USED FROM THE INITIAL STAGES

-MONTHLY PHYSICAL AND FINANCIAL PERFORMANCE SHOULD BE DISPLAYED IN FIELD UNITS FOR THE REFERENCE OF THE PUBLIC CONCERNED

IMPLEMENTATION STRATEGIES

-PILOT AREAS TO BE ESTABLISHED WHERE IMPLEMENTATION OF PREVENTIVE MAINTENANCE WORKS ARE CARRIED OUT UNDER CLOSE SUPERVISION.

-THESE VENUES SHOULD BE WELL MONITORED AND MAINTAINED TO CARRY OUT "ACTION TRAINING" FOR OTHER PROJECT PERSONNEL

-ONCE THE FINANCIAL ALLOCATION IS NOTIFIED, THE DRAFT ANNUAL MAINTENANCE PLAN HAS TO BE UPDATED BY ACCOMMODATING PRIORITY ITEMS

-PREPARATION OF ACTUAL COST ESTIMATES SHOULD BE EXPEDITED.

-IMPLEMENT PREVENTIVE MAINTENANCE ACTIVITIES.

-CONTROL AND MONITOR THE IMPLEMENTATION FROM THE INITIAL STAGES ITSELF

-PROPER RECORD BOOKS, NOTICE BOARDS AND OTHER INFORMATION EXCHANGE DEVICES SHOULD BE DEVELOPED AND USED

-PERIODIC REVIEW SESSIONS TO BE HELD WITH THE PARTICIPATION OF FARMERS AND OTHER PERSONNEL

-WORK EXECUTED SHOULD BE MEASURED PERIODICALLY IN THE PRESENCE OF EMPLOYEES/AGENCY WHO EXECUTED THE WORKS AND COSTING HAS TO BE DONE

REVIEW OF ISMP PROGRAM , CONSTRUCTION SUPERVISION AND QUALITY CONTROL FOR TAs AND DRAUGHTSMEN OF POLONNARUWA RANGE JULY 1990.

COURSE OBJECTIVES

- TO REFRESH ISMP GOALS AND THE CURRENT STATUS OF DIFFERENT ACTIVITIES.
- TO REVIEW ISMP AND MID TERM EVALUATION AND RECOMMENDATIONS.
- TO DISCUSS ACCEPTABLE PROCEDURES FOR INVESTIGATIONS AND DESIGN WORKS OF D.Cs AND F.Cs.
- TO REVIEW FUNDAMENTALS OF CONSTRUCTION MANAGEMENT.
- TO DISCUSS ADAPTABLE QUALITY CONTROL METHODS.
- TO DEVELOP IMPROVED METHODS OF PROGRESS MONITORING IN ORDER TO COMPLETE THE WORKS WITHIN THE ESTIMATES AND CONTRACT PERIOD.
- TO DISCUSS THE WAYS AND MEANS OF IMPROVING FARMERS' PARTICIPATION IN IMPLEMENTATION OF O & M ACTIVITIES.
- TO DISCUSS PROBLEMS OF CONTRACT MANAGEMENT WITH SPECIFIC REFERENCE TO THE FOLLOWING:

  LABOUR SHORTAGE, SUPPLY OF MATERIALS TO CONTRACTORS, ISSUE OF BLASTING MATERIALS, POOR WAGES FOR SKILLED WORKMEN, SHORTAGE OF GOOD QUALITY TIMBER.
- TO DEVELOP GUIDE-LINES FOR IDENTIFYING DIFFERED PRIORITY REHABILITATION WORKS.
- TO DISCUSS METHODS OF FIXING PLASTIC GAUGES.

To : Chief of Party, SAI. 27.8.90

From: Eng. S.Balasingam, O & M Engineer.

Sub : Review Session on Construction Supervision and Quality Control for T.As and W.Ss of Polonnaruwa and Kaudulla Irrigation Engineers' Divisions.

A two days review session on the above subjects was held at the Seruwa Hotel, Polonnaruwa on the 9 & 10 of August 1990.

All I.Es, T.As and W.Ss of the above offices participated showing great enthusiasm as this had been the first opportunity for the majority of them to share their construction experiences. The Design Engineers from the DDI's office had been present as resource personnel.

DDI/ Polonnaruwa had been present on both days which provided encouragement to the other members to participate actively.

SAI personnel, Project Managers and I.D.Os were present at a few occasions and assisted in group discussion sessions.

Eng. S.H.C. de Silva, Consultant, was present on the second day and served as the chief resource person to lead discussion on Contract Management and Quality Control.

Eng. D.P.D. Wickramaratne, C.I.E.(Engineering Materials) participated as a resource person to review quality control methods at the field level.

DDI/Polonnaruwa stressed the importance of the roles and functions to T.As and W.Ss in irrigation system management. He emphasized that T.As and W.Ss should work in close coordination with the D.C.Os to ensure the active participation of the participation at all stages.

Eng.S.H.C. de Silva dealt in details how the I.D. personnel should maintain professionalism in attending to their duties Unification of personnel goals and organizational goals was amplified by quoting examples from I.D. activities. Also, he enumerated the contract management methods in accordance with the accepted norms and the methods of achieving satisfactory results. Construction planning and regular monitoring of all activities were greatly emphasized by him.

Eng. D.P.D.Wickramaratne explained the quality control procedures adaptable at the field level for common civil engineering works encountered in ISMP.

Eng. C.F. Leonhardt, O & M Engineer, SAI discussed the present status and the progress achieved in the ESI works with the aid of accurately prepared graphs and charts. He was able to focus the attention of all I.Es and T.As about the quantum of work to be completed during the rest of LOP (with and without the anticipated extension of LOP) and sought suggestions from them to accomplish the set targets.

Eng. D.A.S.Kulasekara, Operation Engineer, reviewed the goals and the different activities of ISMP. The interrelationship between the different activities and the contribution of each of them to achieve the overall objective of increasing the productivity of the systems were explained to audience with the aid of diagrams.

Eng. S.Balasingam, O & M Engineer, discussed some of the recommendations and comments made by the Mid Term Evaluation Team.

During the field visit on the 9/8/90, the participants were shown the methods of identifying Differed Priority Rehabilitation works from areas which were rehabilitated during 1987, 1988 & 1989. During this visit, it was also possible to highlight some of the avoidable construction faults and methods of effecting technical adjustments when ESI works are carried out in future.

The following items would be commonly accommodated in the estimates of Differed Priority Rehabilitation works.

- Adjustments in the Dry Rubble Packing where small stones were used and improper placings were identified.
- Monolithic construction joints for drop structures .
- Providing earthwork and turfing or extended rubble pitching or dry rubble packing for drop structures and regulators to suit the site conditions.
- Earthwork and rubble packing have to be provided for structures which are completely isolated from the canal banks.
- Grooves for planking and lifting gates to be provided as per approved type plans.
- Restrict the height of the head walls for the turnouts to suit the operational levels.
- Restrict the height of the retaining walls to suit the f.s.d.

* All ends of the retaining walls and rubble packing should be ~~splayed and~~ keyed into the banks.

Group discussions were held on key issues which were impeding smooth implementation of ISMP activities. The agreements reached by the different groups were discussed with the other participants and the following consensus were accepted for implementation.

IMPROVING FARMER PARTICIPATION IN OPERATION AND MAINTENANCE WORKS AND CONSTRUCTION ACTIVITIES FROM INVESTIGATION STAGES.

1. Obtaining priority list from F.Os by T.As through D.C.Os before commencing investigations.

2. Inform the dates of investigations to farmers through F.Os and see that the farmers are available in the field.

3. After framing up proposals, these will be explained to the farmers and after agreement, concurrence will be obtained in writing from them.

4. Finalize the estimates and announce nature of work and amount involved in D.C.Os' meetings.

5. When the work commences at site, D.C.Os will appoint representatives to communicate with I.D staff.

6. A logbook will be maintained by the department at sites to issue instructions and receive requests from the F.Os.

7. Provide higher rates for masonry and concrete works when the quantities of such works are limited to avoid snag in completing these works by the D.C.Os.

8. Issuing water for unauthorized lands to be regulated.

9. I.Es have to strengthen the understanding between F.Os and the field staff by holding joint review meetings.

10. To develop better integration, youths' involvement should be promoted.

11. All shramadana works have to be carried by the F.Os with the active participation of all field staff.

12. Irrigation Department or any other organizations should provide suitable training to skilled workmen to update standard.

13. All farmer organizations should possess a list of resources available with them.

IMPROVING CONTRACT MANAGEMENT AND PROGRESS CONTROL

D.D.I. and I.Es's roles

1. For small canal structures, higher rates to be provided in the Engineer's estimates to ensure good quality and satisfactory progress in D and F canals.

2. For all skilled workmen, higher wages to be paid to influence them to be available for ESI works.

3. Abandoning cultivation during Yala season where large volume of work to be carried out should be looked into. Providing employment to compensate those affected would be possible.

4. Superiors should issue specific and strict instructions to field staff regarding quality control.

5. Additional W.Ss or gang leaders are required for site supervision.

6. Approval of estimates have to expedited by I.Es/D.D.I. to enable T.As to attend to their works.

T.As's and W.Ss's roles

7. On approval of estimates, T.As have to prepare T.B. 1 forms to assess the material requirements.

8. Once the tenderable amounts are determined, T.As are expected to prepare construction programmes in consultation with the contractors and D.COs.

9. All contracting agencies are required to appoint agents who would be available at the sites until completion.

10. Temporary stores to be established to facilitate issue of stores sub-projectwise.

11. Maintenance of Logbooks at sites from the commencement of work until completion in which all instructions and observations are given.

12. W.Ss have to be available for a longer duration at work sites. Instructions to this effect and arrangements for their availability have to be made by I.Es and T.As.

13. Prompt payments should be made to all contractors at regular intervals and the T.As take positive actions.

14. For errant contractors and D.C.Os, advice and warnings have to be given.

15. All T.As are expected to maintain approved progress Monitoring Formats and these formats should be made available to I.Es and D.D.I on due dates.

16. Training sessions have to be organized for D.C.Os in contract management and related fields regularly.

IMPROVEMENTS IN QUALITY CONTROL ACTIVITIES

1. Additional survey instruments would be required for checking levels and setting out purposes.

2. Transport facilities for field staff have to be improved.

3. All essential construction materials and equipments have to be issued by the department.

4. Final payment and retention money should be strictly made after I.E's inspection and satisfaction.

5. Consultants also have to meet the field staff at work sites and advise them.

6. Specifications of works have to be displayed at work sites for the benefits of the workmen.

7. Incentives are required for field staff.

8. For errant contractors and D.C.Os warnings have to be issued in waiting.

9. Regular review sessions have to be held to maintain quality of works carried out by D.C.Os and contractors.

10. Higher officers should inspect works and furnish recommendations and remarks.

MAIN SYSTEM (HEAD WORKS/MAIN/BRANCH CANALS)

SCHEME	CANAL	TYPE	REACH(KM)	POSITION ON 31 DEC. 1991
GAL OYA	SENANAYAKE SAMUDRA H/W	DAM	Ø-1.Ø7	1ØØ% Complete Draft documents under scrutiny.
	LBMC	M/C	Ø-4.Ø	
	LBMC	M/C	4.Ø-8.Ø	do
	LBMC	M/C	8.Ø-11.2	do
	LBMC	M/C	11.2-16.Ø	do
	LBMC	M/C	16.Ø-2Ø.Ø	do
	LBMC	M/C	2Ø.Ø-24.Ø	do
	LBMC	M/C	24.Ø-28.Ø	do
	LBMC	M/C	28.Ø-32.Ø	do
	LBMC	M/C	32.Ø-34.4	do
	UHANA BRANCH CANAL	B/C	Ø.Ø-5.Ø	do
		B/C	5.Ø-1Ø.Ø	do
		B/C	1Ø.Ø-15.2	do
	HANDUR BRANCH CANAL	B/C	Ø.Ø-4.Ø	do
		B/C	.4.Ø-6.Ø	do
		B/C	6.Ø-8.8	do
		B/C	8.8-11.Ø	do
		B/C	11.Ø-15.4	do
	GOHAGOLLA BRANCH CANAL	B/C	Ø.Ø-4.Ø	do
		B/C	4.Ø-8.Ø	do
	INLET CANAL TO WEERAGODA TANK	B/C	Ø-Ø.8Ø	do
	INLET CANAL TO CHADAYANTALAWA TANK	B/C	Ø-2.4Ø	do
	WEERAGODA TANK HEADWORKS	DAM	Ø-Ø.657	do
	HALWATTE BC	B/C	Ø-4.8Ø2	do
	SAMMANTHURAI BC	B/C	Ø-1Ø.2Ø	do
	CHADAYANTALAWA BR. CHL	B/C	Ø-8.77	do
GAL OYA	RPHC	M/C	Ø.Ø-3.Ø	No Work done
	RPHC	M/C	6.Ø-7.Ø	do
	RPHC	M/C	8.Ø-9.Ø	do
	RPHC	M/C	11.Ø-12.Ø	do
	RPHC	M/C	17.Ø-18.Ø	do
	RPHC	M/C	18.Ø-19.Ø	do
	RPHC	M/C	22.Ø-23.Ø	do
	RPHC	M/C	24.Ø-27.Ø	do
	RBHC	M/C	28.Ø-35.Ø	do

QWTHSHB

SCHEDULE FOR WALK THROUGH MAINTENANCE SURVEY OF DCOs - GAL OYA LB

DCO No	NAME OF DCO	NAME OF TA	TARGET DATE OF COMPLETION				
			FIELD WORK	COST EST	MAINT PLAN	ISSUE TREE	BOP
1	LB 1A BATAHIRA	U.R.LIYANAGE/	30.9.91	31.12.91	31.12.91	31.12.91	15.6.92
	DUNGALA	IMPARAJAH	do	do	do	do	do
2	LB 1,2,& 3	do	do	do	do	do	do
3	LB 4	do	do	do	do	do	do
4	LB 5	do	do	do	do	do	do
5	LB 6	do	do	do	do	do	do
6	LB 7 (upper)	do	do	do	do	do	do
7	LB 7 (lower)	do	do	do	do	do	do
8	LB 8	AMARASEKERA/	do	do	do	do	do
9	LB 10	DHARMADASA	do	do	do	do	do
10	LB 11	do	15.1.92	29.2.92	29.1.92	15.3.92	do
11	LB 11A & B	do	do	do	do	do	do
12	LB 12	do	do	do	do	do	do
13	LB14	do	do	do	do	do	do
14	LB 15	do	15.2.92	31.3.92	31.3.92	15.4.92	do
15	LB 16	do	do	do	do	do	do
16	UB 1	do	do	do	do	do	do
17	UB 2	do	do	do	do	do	do
18	UB 5,4 & 5B	do	15.3.92	30.4.92	30.4.92	30.4.92	do
19	UB 7	do	do	do	do	do	do
20	UB 8 & 8A	do	do	do	do	do	do
21	UB 9 & 10	do	do	do	do	do	do
22	UB 11	do	15.4.92	15.5.92	15.5.92	15.5.92	do
23	UB 12	do	do	do	do	do	do
24	UB 13,14,15&16	do	do	do	do	do	do

58

SCHEDULE FOR WALK THROUGH MAINTENANCE SURVEY OF DCOs - GAL OYA LB

DCO No	NAME OF DCO	NAME OF TA	TARGET DATES OF COMPLETION				
			FIELD WORK	COST EST	MAINT PLAN	ISSUE TREE	BOP
25	UB 17	JAYAWARDENA	30.9.91	15.1.92	15.1.92	31.1.92	31.5.92
26	M 01	do	,,	,,	,,	,,	,,
27	M2, 3 & 4	do	,,	,,	,,	,,	,,
28	M 5	do	,,	,,	,,	,,	,,
29	M 5.2	do	,,	31.1.92	31.1.92	15.2.92	,,
30	M 5.4	do	,,	,,	,,	,,	,,
31	M6.7	do	,,	,,	,,	,,	,,
32	M 8	do	,,	,,	,,	,,	,,
33	M 9.11	do	,,	,,	,,	,,	,,
34	M 12	do	,,	,,	,,	,,	,,
35	M 16	do	,,	,,	,,	,,	,,
36	M 17 & 20	do	,,	,,	,,	,,	,,
37	LB - 19 & 20	MAITRIPALA	,,	15.1.92	15.1.92	29.2.92	,,
38	LB 21 & 22	do	,,	,,	,,	,,	,,
39	LB 23,24 & 25	do	,,	,,	,,	,,	,,
40	LB 29,30,31, 32 & G-1	do	,,	,,	,,	,,	,,
41	G 3	do	,,	,,	,,	,,	,,
42	G 5	do	,,	31.1.92	31.1.92	29.2.92	,,
43	G 6	do	,,	,,	,,	,,	,,
44	G 4 & 7	do	,,	,,	,,	,,	,,
45	G 10	do	,,	,,	,,	,,	,,
46	G 2 & LB 27	do	,,	,,	,,	,,	,,
47	G 11	do	,,	,,	,,	,,	,,
48	G 9 & 12	do	,,	,,	,,	,,	,,
49	& G 13,14,15,&16 PERAKUM	do	,,	,,	,,	,,	,,
50	PADDANGALAYAYA	do	15.1.92	15.2.92	15.2.92	15.3.92	,,
51	RUHUNUGAMA	do	,,	,,	,,	,,	,,
52	LB 34,35&36	do	,,	,,	,,	,,	,,
53	LB 37,38,39	do	,,	,,	,,	,,	,,
54	LB 40,41,42	do	,,	,,	,,	,,	,,

59

DCO No	NAME OF DCO	NAME OF TA	TARGET DATE OF COMPLETION				
			FIELD WORK	COST EST	MAINT PLAN	ISSUE TREE	BOP
1	RB 1 - 6	M Kanapathi-	30.9.91	31.1.92	31.1.91	15.2.92	31.5.92
2	RB 7,8&11,G1&2	pillai	,,	,,	,,	,,	,,
3	G3,4&Tail/ Galmadu Br	do	,,	,,	,,	,,	,,
4	V-1 to 9	do	,,	,,	,,	,,	,,
5	V 10 - 19	do	,,	,,	,,	,,	,,
6	RB1A-16&16A& Damana Br Chl	do	,,	,,	,,	,,	,,
7	RB 20	do	,,	,,	,,	,,	,,
8	I 1 to 4	do	,,	,,	,,	,,	,,
9	WG 1 to 9	SA Jabar/	31.12.91	31.1.91	31.1.92	29.2.92	,,
10	WG 10 to 12	N Sinnathamby	30.9.91	31.12.91	31.12.91	,,	,,
11	WG 13 to 18&tail end of WG	do	31.12.91	31.1.91	29.2.92	,,	,,
12	RB 23,26&27	do	,,	,,	,,	,,	,,
13	Illukkuchenai	do	,,	,,	,,	,,	,,
14	Neethai	do	,,	,,	,,	,,	,,
15	PK 1 to 8	do	,,	,,	,,	,,	,,
16	PK 9 to 12 & 14	do	,,	,,	,,	,,	,,
17	PK 13, 15 to 19	do	31.1.92	29.2.92	29.2.92	21.3.92	31.5.92
18	PK 20 to 31	do	,,	,,	,,	,,	,,
19	RB 31	do	,,	,,	,,	,,	,,
20	TA 1 to 17	do	,,	,,	,,	,,	,,
21	RB 35A to 36A	do	,,	,,	,,	,,	,,
22	AK 1 to 5	do	29.2.92	31.3.92	31.3.92	15.4.92	,,
23	AK 6 to 8	do	,,	,,	,,	,,	,,
24	AK 9	do	,,	,,	,,	,,	,,
25	AK 10	do	,,	,,	,,	,,	,,
26	RB 24,25,29&30	do	,,	,,	,,	,,	,,
27	RB 32	do	,,	,,	,,	,,	,,
28	VR 1 to 7	MHA Sathar/	30.9.91	31.12.91	31.1.92	29.2.92	,,
29	VR 7 to 13	Gunadasa	31.12.92	31.1.92	31.1.92	29.2.92	,,
30	KL 6, 8 to 13	do	,,	,,	,,	,,	,,
31	RB 35	do	,,	,,	,,	,,	,,
32	SK 4&KL 14 to 18	do	,,	,,	,,	,,	,,
33	KL 19 to 23	do	31.1.92	29.2.92	29.2.92	31.3.92	,,
34	KL 24 to 30	do	,,	,,	,,	,,	,,
35	SK 5 to 13	do	,,	,,	,,	,,	,,
36	SK 14 to 18	do	,,	,,	,,	,,	,,

Note: 1. DCO names for RB are not recorded yet as per amended DCO Plan.
2. Only canal Nos. are given above

WALK THROUGH MAINTENANCE SURVEY
(MAIN AND BRANCH CHANNELS) GAL OYA SCHEME

No	NAME OF SCHEME CANAL REACH	NAME OF TA	TARGET DATE OF COMPLETION				
			FIELD WORK	COST EST	MAINT PLAN	ISSUE TREE	BOP
1	SENANAYAKE SAMUDRA HEADWORK	AMARASEKERA	30.6.91	30.9.91	30.9.91	---	---
2	RBMC Ø-18.Ø KM	M KANAPATHI-PILLAI	30.11.91	31.12.91	31.12.91	15.2.91	15.5.91
3	RBMC 18.Ø-35.20 KM	SA JABAR	30.11.91	30.9.91	30.9.91	15.2.91	15.5.91
4	LBMC Ø-34.40 KM	AMARASEKERA	30.6.91	31.1.92	31.1.92	31.12.91	15.3.92
5	UHANA BC Ø-15.20 KM	AMARASEKERA	31.12.91	31.1.92	31.1.92	29.2.91	15.6.92
6	MANDUR BC Ø-15.40 KM	JAYAWARDENA	31.12.91	30.11.91	30.11.91	29.2.91	15.6.92
7	GOHAGOLLA BC Ø-8.Ø KM	MAITHRIPALA	30.6.91	30.9.91	30.9.91	31.1.92	15.6.92

AWPWTSGO

ANNUAL MAINTENANCE PLANS & COST ESTIMATES
TERTITARY SYSTEMS - RBE

No.	NAME OF DCO	FIELD WORK	COST EST %	MAINT PLAN %	ISSUE TREE %	BOP %	Sinhala Translation
1	KATAGAMUWA (INLET CANAL)	100	100	100	100	50	0
2	MAGALLEGAMA	100	100	100	100	50	100
3	CENTRAL CANAL	100	100	100	100	50	100
4	DANDUWAWA	100	100	100	100	50	0
5	THARANAGOLLA	100	100	100	100	50	0
6	DANGAHAWELAYAYA	100	100	100	100	50	0
7	HEELOGAMA	100	100	100	100	50	0
8	DIVULLEWA	100	100	100	100	50	0
9	BUDUHUTTAWA	100	100	100	100	50	0
10	BALANGOLLAGAMA	100	100	100	100	50	0
11	LUBAWELA	100	100	100	100	50	0

WLKSVY

ISMP

ANNUAL MAINTENANCE PLAN - GIRITALE SCHEME

INLET CANAL, HEADWORKS & MAIN/BRANCH CANALS

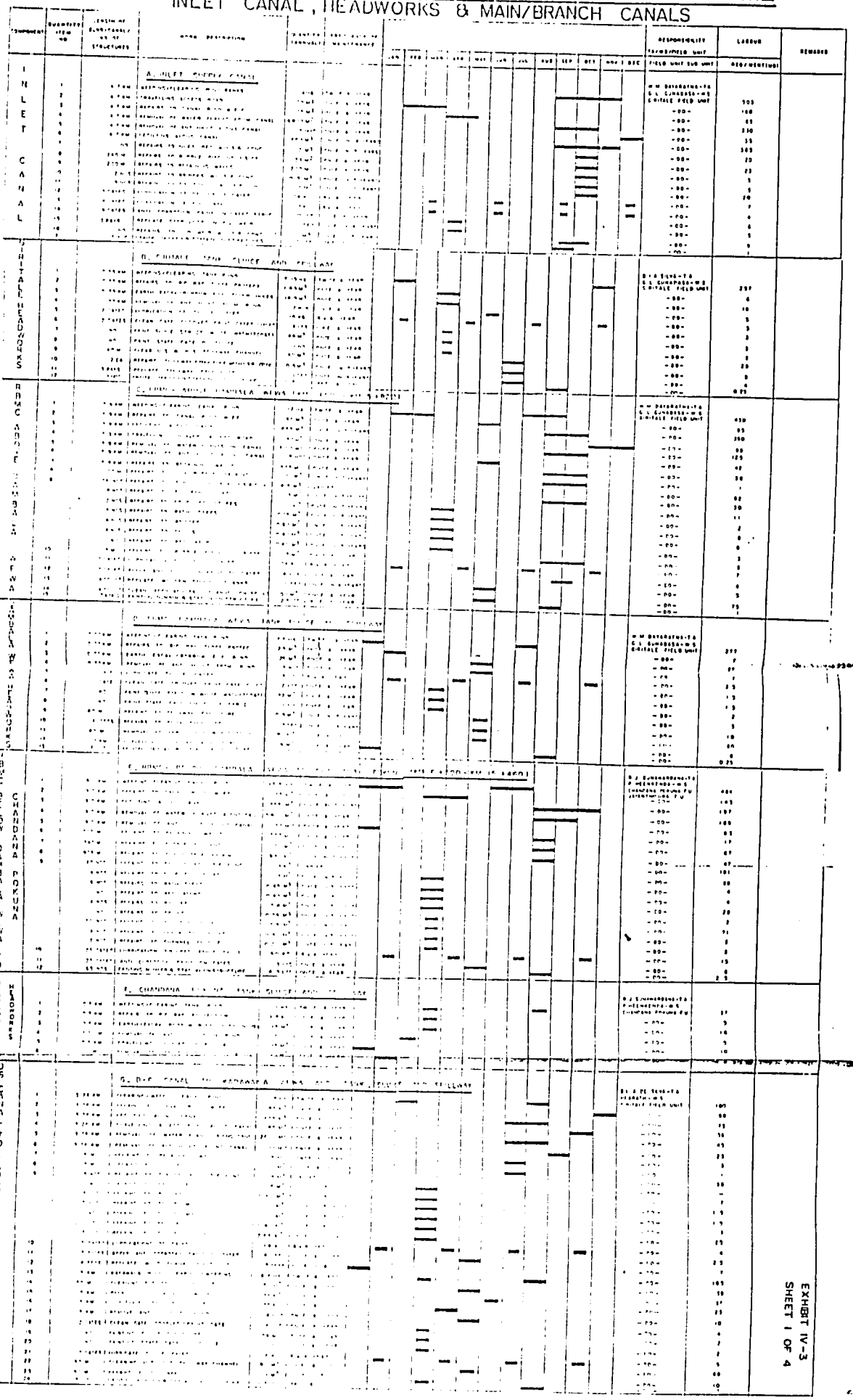
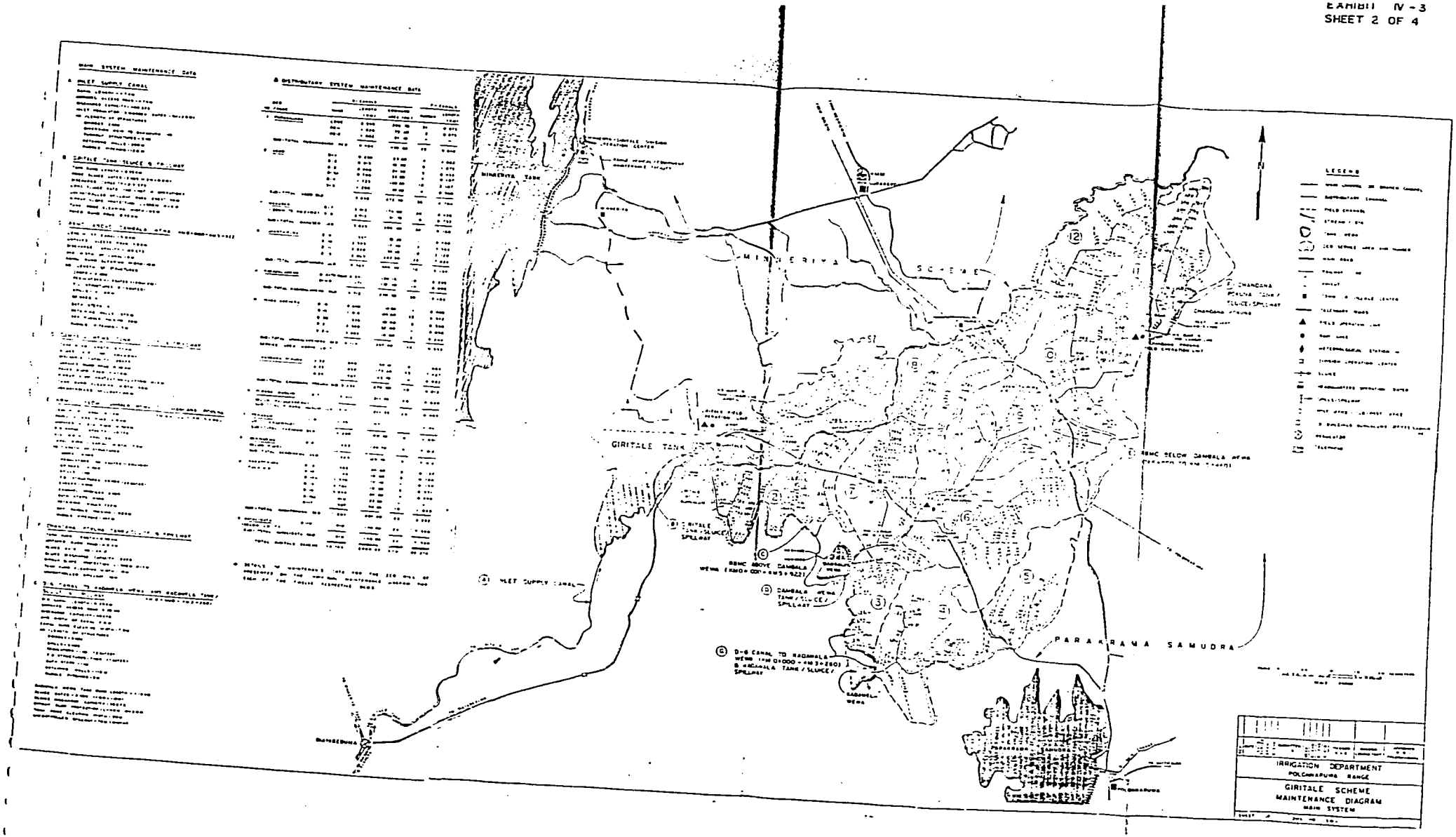
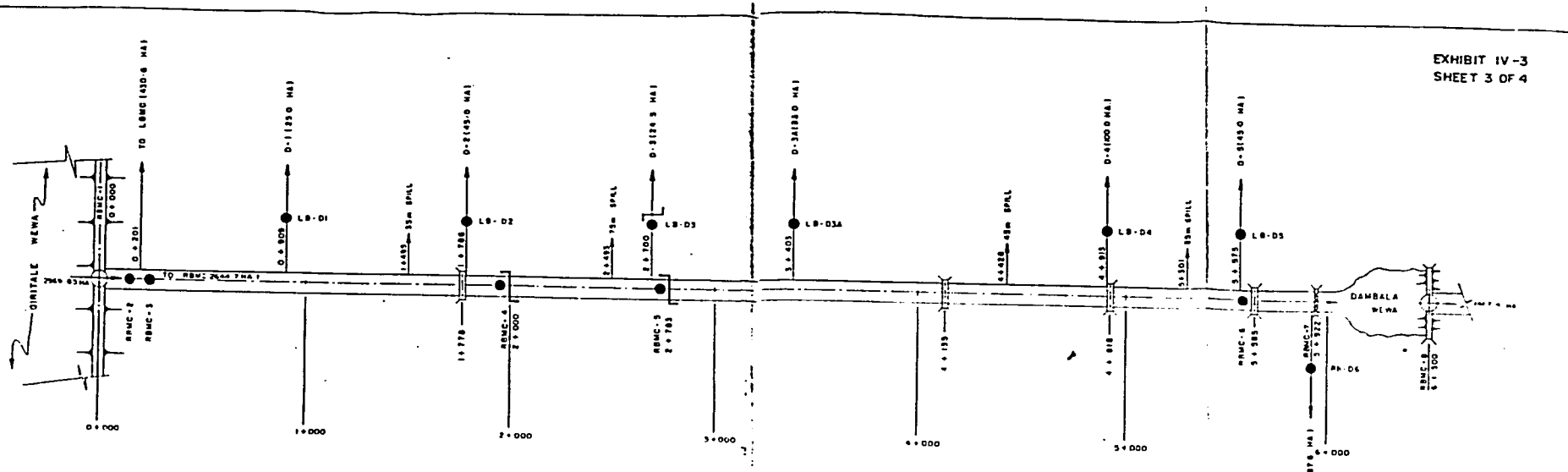


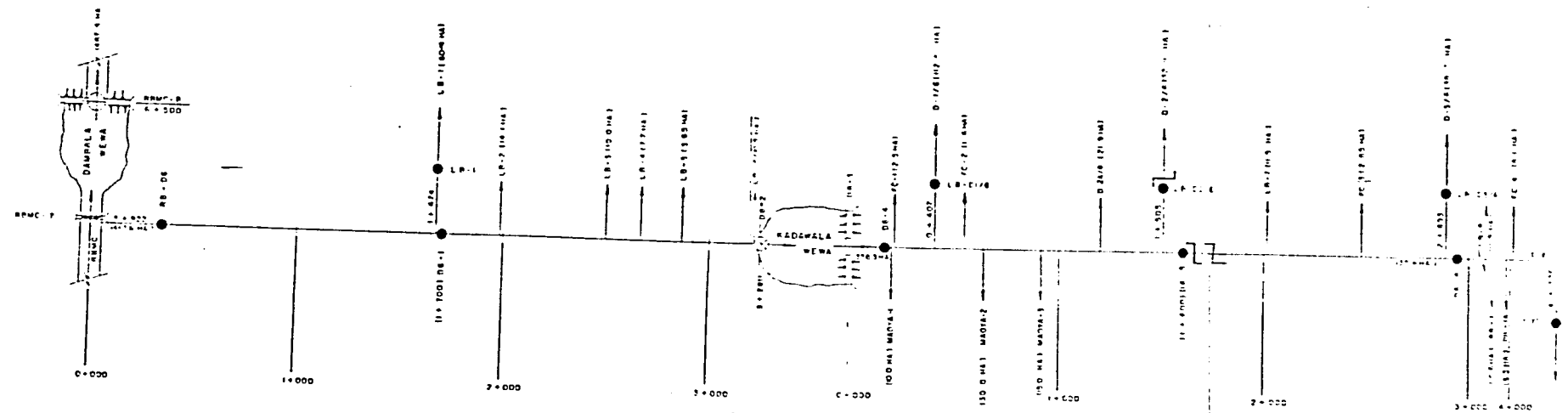
EXHIBIT IV-3
SHEET 1 OF 4





RBMC SYSTEM "A"

GIRITALE TANK TO DAMBALA WEWA
RBMC STA 0 + 000 TO STA 5 + 922



KADAWALA WEWA SYSTEM "A"

RBMC TO KADAWALA WEWA
STA 0 + 000 TO STA 3 + 260

KADAWALA WEWA SYSTEM "B"

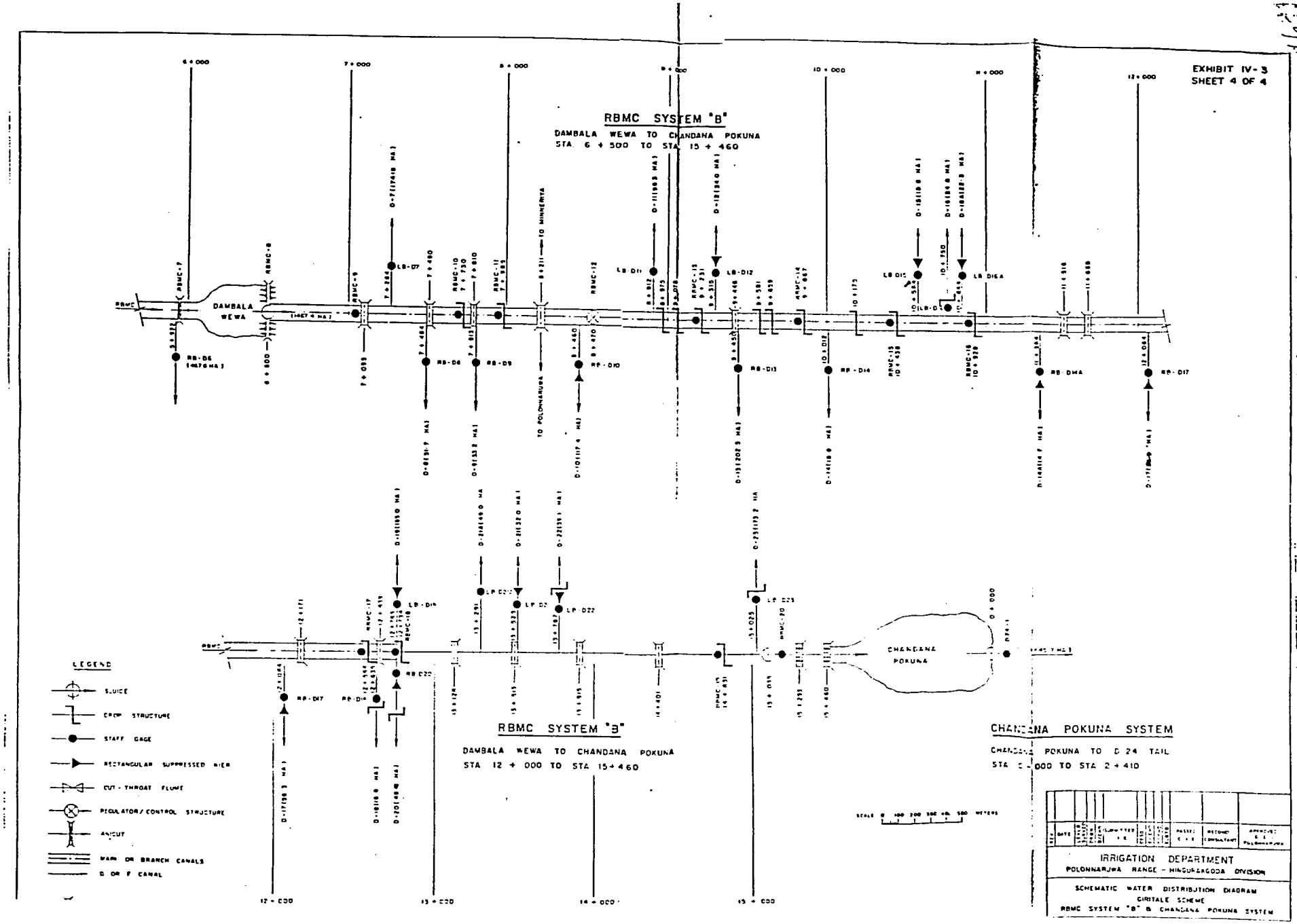
KADAWALA WEWA TO RB-2
STA 0 + 000 TO STA 4 + 226

LEGEND

- SLUICE
- DROP STRUCTURE
- STAFF GAGE
- RECTANGULAR SHARPCRESTED WEIR
- REGULATOR / CONTROL STRUCTURE
- ANICUT
- MAIN OR BRANCH CANALS
- D OR F CANAL

IRRIGATION DEPARTMENT
POLONNARUWA RANGE - MINIPAMADDA DIVISION
SCHEMATIC WATER DISTRIBUTION DIAGRAM

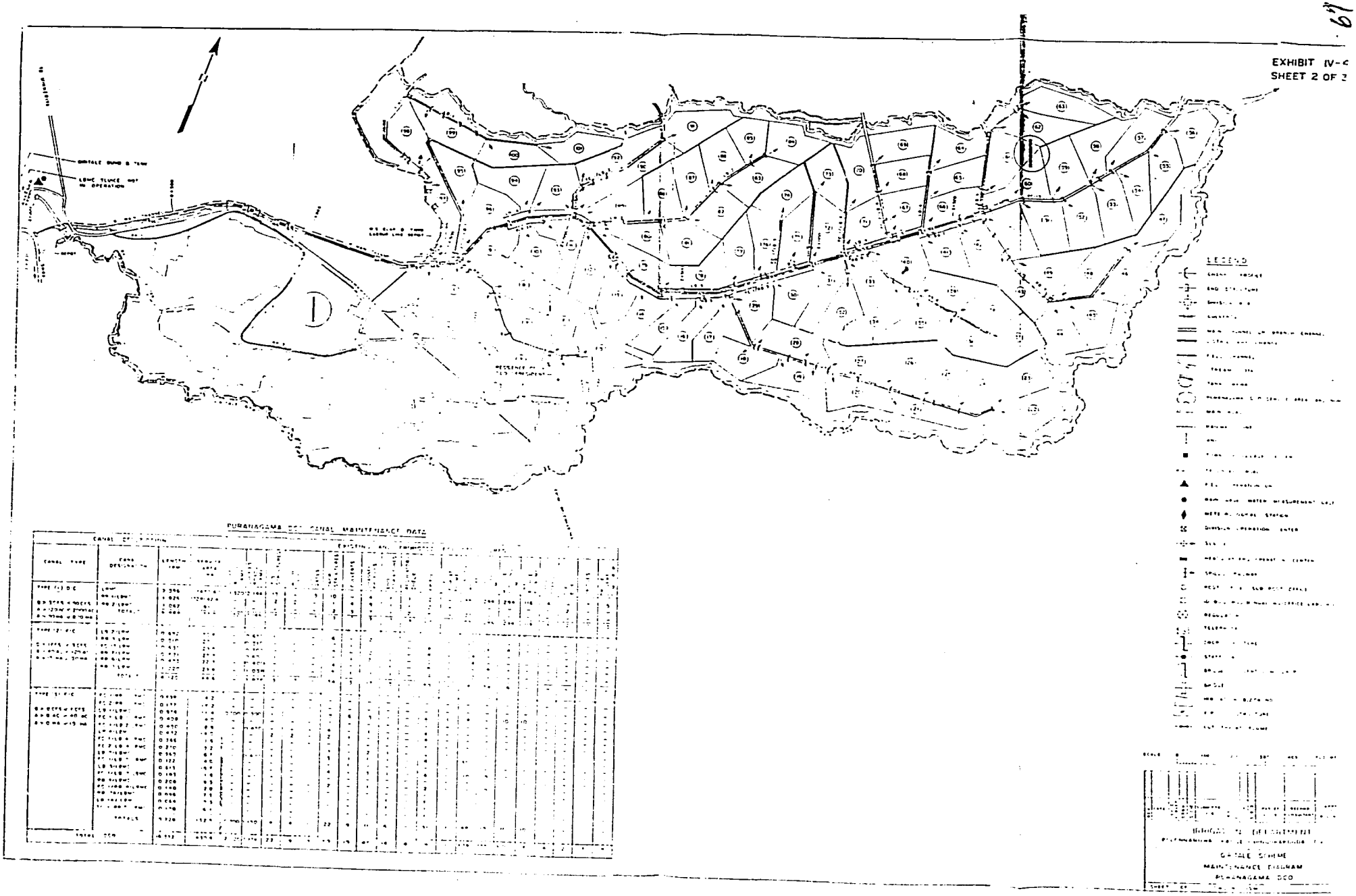
EXHIBIT IV-3
SHEET 4 OF 4



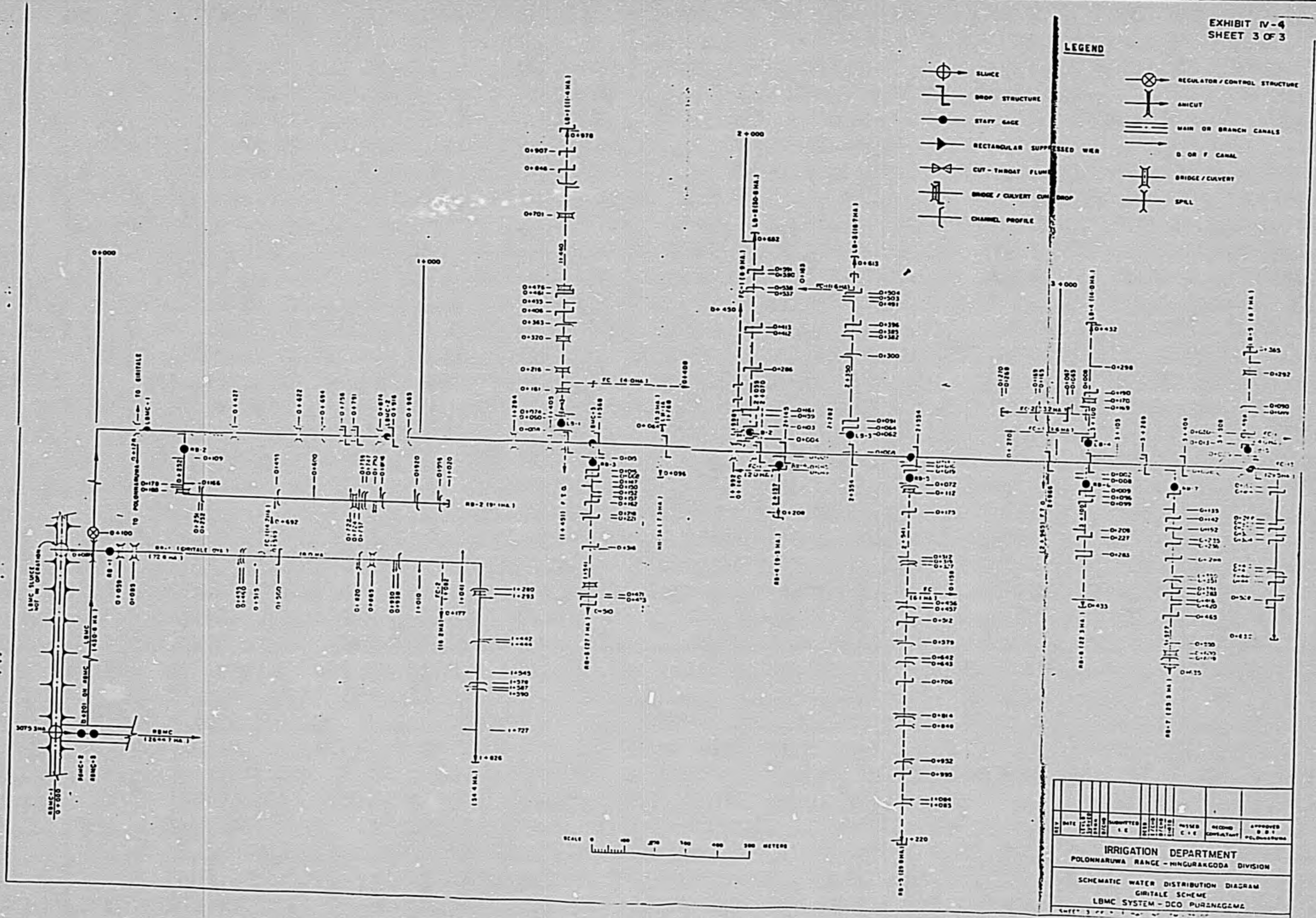
IRRIGATION DEPARTMENT
POLONNARUWA RANGE - HINGURAKGODA DIVISION

SCHEMATIC WATER DISTRIBUTION DIAGRAM
GIRITALE SCHEME
RBMC SYSTEM "B" & CHANDANA POKUNA SYSTEM

EXHIBIT IV-C
SHEET 2 OF 3



BEST AVAILABLE COPY



89

BEST AVAILABLE COPY

ANNUAL MAINTENANCE PLAN AND COST ESTIMATES
MAIN SYSTEM (HEAD WORKS / MAIN / BRANCH / CANALS)

SCHEME	CANAL	TYPE	REACH (KM)	POSITION ON 31 DEC. 1991
PARAKRAMA SAMUDRA	D-1 NORTH	M/C	8.0-10.5	100% Complete
	D-1 NORTH	M/C	10.5-11.69	Final print
	D-1 EAST	M/C	5.0-9.2	under production
	D 2 MAIN	M/C	4.25-5.9	do
	BR21/D1 NORTH	M/C	0.0-4.81	do
	BR18/D1 NORTH	M/C	0.0-1.09	do
	INLET CANAL/ HEAD WORKS	B/C	0.0-8.0	do
	D 1 NORTH	M/C	2.86-4.10	do
GIRITALE	RPHC	M/C	0.0-1.6	100% Complete
	RPHC	M/C	0.6-6.3	100% Complete
MINNERIYA	YODA ELA (MYE)	M/C	15.18	100% Complete
	D-28/MYE	M/C	0.0-4.6	Final print
	D 21/MYE	M/C	0.0-6.0	under production
	GALAMUNA	BC	0.0-3.5	do
KAUDULLA	D 1/LLHC	M/C	0.0-1.447	100% Complete
	LLHC	M/C	5.0-11.3	Final print
	HLHC	M/C	0.0-0.80	under production
	HLHC	M/C	0.80-7.50	do
	HLHC	M/C	0-6.40	do

ANNUAL MAINTENANCE PLAN & COST ESTIMATES
DISTRIBUTARY CANAL SYSTEM - PARAKRAMA SAMUDRA SCHEME

DCO No	NAME OF DCO	FIELD WORK %	COST EST %	MAINT PLAN %	ISSUE TREE %	BOR %	Sinhala Trans.
1	AMBANGANGA	100	100	100	100	0	100
2	ALUTHWEWA	100	100	100	100	0	100
3	D - 4 CHL	100	100	100	100	0	100
4	LAKAUYANA	100	100	100	100	0	0
5	MANIKKAMPATTIYA	100	100	100	100	0	100
6	TALPOTHA	100	100	100	100	0	100
7	THAMBALA(ALAHITLALPURA)	100	100	100	100	0	0
8	SOMAWATHIYA	100	100	100	100	0	0
9	KEGALUGAMA	100	100	100	100	0	0
10	PULASTIGAMA	100	100	100	100	0	0
11	GEMUNUPURA	100	100	100	100	0	0
12	GALTHAMPARAWA	100	100	100	100	0	0
13	SEWAGAMA	100	100	100	100	0	0
14	PALUGASPAHANA	100	100	100	100	0	0
15	HOMAGATENNA	100	100	100	100	0	0
16	VIJAYARAJAPURA	100	100	100	100	0	100
17	SINHARAJAPURA	100	100	100	100	0	0
18	PAHALAKALINGALA	100	100	100	100	0	0
19	SUNGAWILLA/MOHIDEEN	100	100	100	100	0	0
20	VEERAPURA	100	100	100	100	0	100
21	KALAHAGALA	100	100	100	100	0	0
22	PAHANA GEMUNUPURA	100	100	100	100	0	0
23	SINHAPURA	100	100	100	100	0	0
24	VIJAYAPAPURA	100	100	100	100	0	0
25	LANKAPURA	100	100	100	100	0	100
26	VEERA PEDESA	100	100	100	100	0	100
27	2 CHL VEERAPARAKRAMA	100	100	100	100	0	100
28	MAHASEN	100	100	100	100	0	0

ANNUAL MAINTENANCE PLAN & COST ESTIMATES
DISTRIBUTARY CANAL SYSTEMS - MINNERIYA SCHEME

DCO No.	NAME OF DCO	FIELD WORK %	COST EST %	MAINT PLAN %	ISSUE TREE %	BOP %	Sinhala Trans.
1	Raja Ela	100	100	100	100	0	0
2	Kotalawela	100	100	100	100	0	0
3	Hingurakа	100	100	100	100	0	0
4	Kumarayama	100	100	100	100	0	0
5	Hingurakdamana	100	100	100	100	0	0
6	Kotigahapitiya	-----	-----	-----	------	----	-------
7	Kandulla	100	100	100	100	0	0
8	Galamuna Gamunu	100	100	100	100	0	0
9	Galamuna Perakum	100	100	100	100	0	0
10	Galamuna Wijaya	100	100	100	100	0	0
11	Yoda Ela	100	100	100	100	0	100
12	Kusumpokuna	100	100	100	100	0	0
13	Vitharamawatha	100	100	100	100	0	100
14	Yatigalpothana	100	100	100	100	0	0
15	Hathamuna	100	100	100	100	0	100
16	Hipathuwa	100	100	100	100	0	100
17	Divulankadawela	100	100	100	100	0	100
18	Hahaeen	100	100	100	100	0	100
19	Govt. Farm	----	-----	------	------	----	-------
20	Hiraanka	100	100	100	100	0	0
21	Sanasumpama	100	100	100	100	0	0

WLK:VY

ANNUAL MAINTENANCE PLAN & COST ESTIMATES
DISTRIBUTARY CANAL SYSTEMS - GIRITALE SCHEME

No.	NAME OF DCO	FIELD WORK %	COST EST %	MAINT PLAN %	ISSUE TREE %	DOF %	Sinhala Transla
1	PURANAGAMA	100	100	100	100	100	Ø
2	AGBO	100	100	100	100	100	Ø
3	MAHASEN	100	100	100	100	100	Ø
4	JAYANTHIPURA	100	100	100	100	100	Ø
5	KADAWALA WEWA	100	100	100	100	100	Ø
6	UNAGALAWEHERA	100	100	100	100	100	100
7	CHANDANAPOKUNA	100	100	100	100	100	100
8	PURANA MUSLIM	100	100	100	100	100	Ø
9	PARAKUM	100	100	100	100	100	Ø
10	MEDIWEWA	100	100	100	100	100	Ø
11	NAGAPOKUNA (PULASTI)	100	100	100	100	100	Ø
12	MATASIGATA	100	100	100	100	100	Ø

WLKSVY

ANNUAL MAINTENANCE PLANS & COST ESTIMATES
DISTRIBUTARY CANAL SYSTEMS - KAUDULLA SCHEME

DCO No	NAME OF DCO	FIELD WORK %	COST EST %	MAINT PLAN %	ISSUE TREE %	BOP %	Sinhala Trans.
1	EKSATH	100	100	100	100	0	100
2	HENIK HOROWWA	100	100	100	100	0	100
3	SAMA	100	100	100	100	0	100
4	GOVISETHA	100	100	100	100	0	100
5	MAHDALAGIRI	100	100	100	100	0	0
6	KALINGA ELA	100	100	100	100	0	0
7	C.P PURA PERAKUM	100	100	100	100	0	0
8	PUBUDU	100	100	100	100	0	0
9	SUHADA EKSATH	100	100	100	100	0	100
10	SRI NAGA	100	100	100	100	0	0
11	VIJAYAPURA VIJAYA	100	100	100	100	0	0
12	SAMAGI	100	100	100	100	0	100
13	MAHINDAPURA	100	100	100	100	0	100
14	MAHAWELI	100	100	100	100	0	0
15	D.S. SENANAYAKE	100	100	100	100	0	0
16	SRI VIJAYA	100	100	100	100	0	0
17	WEERA KETTETIPOLA	100	100	100	100	0	0
18	NAGARAPURA SAMANA	100	100	100	100	0	100
19	MAHASEN	100	100	100	100	0	0
20	EKSATHGOVI	100	100	100	100	0	0
21	VIJITHA	100	100	100	100	0	0
22	PRAGATHI	100	100	100	100	0	0

WLKSVY

IRRIGATION SYSTEMS MANAGEMENT PROJECT

ANNUAL MAINTENANCE COST OF MAIN SYSTEM COMPONENTS

	1 NAME OF SCHEME	2 COMMAND AREA ACRES	3 COMMAND AREA HECTARES	4 HEAD WORKS CIVIL COST	5 MAIN + BR CHANNELS CIVIL COST Rs.	6 TOTAL CIVIL COST Rs.	7 CONTINGEN-CIES Rs.	8 TOTAL DIRECT COST Rs.	9 ADMIN. COST Rs.	10 TOTAL MAINT COST Rs.	11 COST/AC	12 COST/HA
1	GIRITALE	7,340	2,970	187,049	455,393	642,442	46,449	688,891	339,304	1,028,195	140	346
2	PSS	20,247	8,197	500,451	985,909	1,486,360	107,464	1,593,824	785,018	2,378,842	117	290
3	MINNERITA	23,672	9,584	178,632	1,148,852	1,328,584	95,478	1,416,062	697,463	2,113,526	89	221
4	KAUDULLA	10,824	4,382	452,017	871,106	1,323,123	95,662	1,418,785	698,804	2,117,589	196	483
5	RBE	5,553	2,248	502,151	888,181	1,390,332	100,521	1,490,853	734,301	2,225,154	401	990
6	GAL OYA LB	61,750	25,000		COST ESTIMATE UNDER PREPARATION							
7	GAL OYA RB	34,474	13,957		COST ESTIMATE UNDER PREPARATION							
	TOTAL	163,860	66,338	1,812,300	4,350,641	6,162,841	445,573	8,608,414	3,254,891	9,863,305		

S U M M A R Y

POLONNARUWA SCHEME	POLONNARUWA + RBE	POLONNARUWA + RBE + GAL OYA SCHEMES
AREA 62,083 Acs	67,636 Acs	163,860 Acs
TOTAL COST 7,638,152	9,863,305	23,923,560 BUDGET FOR ISMP SCHEMES (ASSUMING AVERAGE OF Rs.146/Acre.)
COST/ACRE 123	146	

Note: For Polonnaruwa and Kurunegala Schemes the command areas have been taken from DCO Walk Through Surveys which require further scrutiny and confirmation.

AMCMSCeb

ANNUAL MAINTENANCE COST OF DCOs SYSTEM - GIRITALE SCHEME

DCO No.	DCO NAME	COMMAND AREA Ha	COMMAND AREA Ac	LABOUR COST Rs.	MAT/EQUP. TRANS. COST Rs.	TOTAL COST Rs.	UNIT COST PER Ha	UNIT COST PER Ac	
1	PURANAGAMA	430.60	1064.00	143,560	38,960	182,520	423.87	171.54	
2	AGBOPURA	272.50	675.00	78,700	29,360	120,060	440.59	177.87	
3	PARAKUM	109.35	270.20	28,730	11,920	40,650	371.74	150.44	
4	KADAWALAWEWA	240.55	595.00	97,350	32,350	129,700	539.18	217.98	(1)
5	BENDIWEWA	126.70	313.00	51,450	17,150	68,600	541.44	219.17	(1)
6	JAYANTIPURA	449.40	1110.50	164,960	58,270	223,230	496.73	201.02	
7	MAHASEN	206.60	510.50	84,550	25,225	109,775	531.34	215.03	
8	PURANA MUSLIM	211.35	522.00	100,160	33,020	133,180	630.14	255.13	(2)
9	NAGAPOKUNA	201.20	497.00	67,760	23,560	91,320	453.88	183.74	
10	UNAGALAWEHERA	297.60	735.00	117,540	37,130	154,670	519.72	210.44	
11	CHANDRAPOKUNA	270.00	667.00	110,400	38,785	149,265	536.92	217.27	
12	HATALLISATA	146.00	361.00	75,050	23,200	98,250	672.95	272.16	(2)
	TOTAL	2767.85	7340.20	1,132,270	368,930	1,501,220	585.49	204.52	
	SAY	2770 Ha	7340 Ac						

Average Cost per Ac. 1,501,220/7,340 = Rs. 204.53

1. All paddy lots of extent 2.0 Ac
2. Re-use of water from anicut (Independent water supply)

ancdco

ANNUAL MAINTENANCE COST OF DCOs SYSTEM - MINNERIYA SCHEME .

DCO No.	DCO NAME	COMMAND AREA Ha	COMMAND AREA Ac	LABOUR COST Rs.	MAT/EQUIP. TRANS. COST Rs.	TOTAL COST Rs.	UNIT COST PER Ha	UNIT COST PER Ac
1	ULPOTHWEWA	423.45	1045	86898	40878	127765	302	122
2	KOTALAWELA	580.74	1434	102898	53975	156865	270	109
3	KUMARAGAMA	233.00	575	105153	48769	153922	661	268
4	VIHARAMAWATHA	664.16	1640	246898	91549	338439	510	206
5	HINGURAKDAMANA	996.98	2462	122377	47499	169876	170	69
6	GALAMUNA GEMUNU	469.15	1159	171684	57356	229040	488	198
7	NISSANKA	441.50	1091	130957	25438	156387	354	143
8	GALAMUNA VIJAYA	274.00	677	68885	38438	107243	391	158
9	SANSUNGAMA .	397.97	983	140556	66365	206921	520	210
10	KAUDULLA	369.21	912	105167	51473	156642	424	172
11	RAJAELA	664.00	1640	252261	105465	357726	539	218
12	NAVAKUSUMPOKUNA	747.73	1847	153650	63806	217456	291	118
13	HINGURAKA	688.56	1761	86929	35755	122684	178	70
14	MAHASEN	361.44	893	196731	69070	265801	735	298
15	YODAELA	535.21	1322	96433	51815	148248	277	112
16	YATIYALPOTANA	412.19	1018	86485	49953	136438	331	134
17	PERAKUM	430.68	1064	146571	41626	188197	437	177
18	HATAMUNA	656.18	1621	104778	42497	147275	224	91
19	DIVULANKADAWELA	237.83	587	64719	21639	86558	364	147
	TOTAL	9583.77	23731.00	2,470,170	1,003,355	3,473,483	7,467	3,021

Average Annual Maintenance Cost = 3,473,483/23,731 = Rs. 146

aacdco

ANNUAL MAINTENANCE COST OF DCUs SYSTEM - PARAKRAMA SAMUDRA SCHEME

DCU No.	DCU NAME	COMMAND AREA Ha	COMMAND AREA Ac	LABOUR COST Rs.	MAT/EQUP. MAINT. COST Rs.	TOTAL COST Rs.	UNIT COST PER Ha	UNIT COST PER Ac
1	AMBANGANGA	443.79	1097	176,750	52,250	229,000	516.01	208.75
2	ALUTHNEWA	364.3	900	195,600	52,650	248,250	681.07	275.83
3	WEERAPEDESA	22.3	55	17,600	4,600	22,200	995.52	403.64
4	2 ELA DCO	93.7	231.5	26,530	14,700	41,200	439.78	177.97
5	4 ELA DCO	145.7	360	48,850	19,850	68,700	471.52	190.83
6	MANIKKAMPITIYA	414.33	1024	116,000	39,000	155,000	374.18	151.37
7	GALTHAMBARAWA	291	719	128,550	71,500	200,000	687.29	278.16
8	VIJAYARAJAPURA	442	1092	185,700	69,000	255,700	578.51	234.16
9	SINHARAJAPURA	418.6	1035	85,250	35,900	121,150	289.42	117.05
10	PANALA PALINGA ELA	359.7	889	89,700	42,300	132,000	366.97	148.48
11	MOHARATENNA	188.6	465	68,800	26,100	94,900	503.18	204.09
12	PANANA GENUWU-PURA	276.72	684	95,700	38,200	134,100	484.61	196.05
13	PALUGASPANANA	511.95	1265	141,350	70,000	212,150	414.48	167.71
14	SEWAGAMA	656.67	1623	257,700	62,200	319,900	487.14	197.10
15	LAKSAUYANA	255	630	70,900	31,900	122,800	481.57	194.92
16	VIJAYAPURA	180	445	57,150	19,000	76,150	423.06	171.12
17	SINHAPURA	302.12	747	62,050	35,700	97,750	323.55	130.86
18	TALPOTHA	216.19	534	105,150	36,200	141,350	653.82	264.70
19	LANKAPURA	244.81	605	101,900	38,800	105,700	431.76	174.71
20	WEERAPURA	263	650	114,100	36,250	150,350	571.67	231.31
21	THAMBALA	151.85	375	74,900	27,200	102,100	672.37	272.27
22	GEMUNUPURA	408	1008	126,800	36,300	163,100	399.75	161.81
23	MAHASEN	320	790	120,500	47,300	167,800	530.63	214.94
24	DEGALUGAMA	200	494	94,650	43,800	138,450	692.25	280.26
25	SOMAPURA/ APAYAPURA	260	642	154,550	52,650	207,200	796.92	322.74
26	SUNGAEELA	274	677	107,600	43,000	150,600	549.64	222.45
27	PULASTIGAMA	305	951	162,200	81,800	244,000	633.77	256.57
28	KALAHAGALA	100.07	247	36,700	6,500	43,200	377.67	161.80
	TOTAL	8177.64	20254.5	3,043,600	1,137,450	14,181,050	510.03	206.43

ANNUAL MAINTENANCE COST OF DCOs SYSTEM - KAUDULLA SCHEME

DCO No.	DCO NAME	COMMAND AREA Ha	COMMAND AREA Ac	LABOUR COST Rs.	MAT/EQUP. TRANS. COST Rs.	TOTAL COST Rs.	UNIT COST PER Ha	UNIT COST PER Ac
1	EKSATH	182.20	450	140607	36357	176964	971	393
2	MENIKHOROWWA	98.40	243	44155	16369	60524	615	249
3	SAMA	196.00	484	92094	32631	124725	636	258
4	GOVISETHA	115.80	286	52234	19285	71519	618	250
5	MANDALAGIRI	190.00	469	104588	38626	143214	754	305
6	KALINGA ELA	211.25	525	125254	41751	167005	791	318
7	CP PURA PERAKUM	405.00	1000	275744	75103	350847	866	351
8	PURUDU	289.00	714	171354	57118	228472	791	320
9	SUHADA EKSATH	253.50	626	130776	48691	179467	708	287
10	SRI NAGA	131.98	326	64534	23058	87592	664	269
11	VIJAYAPURA VIJAYA	157.80	390	93563	31188	124751	791	320
12	SANAGI	252.40	623	156716	49546	206262	817	331
13	MAHINDAPURA	241.00	595	118314	34068	152382	632	256
14	MAHAWELI	77.68	192	33491	11421	44912	578	234
15	DS SENANAYAKE	168.70	417	100433	37198	137623	816	330
16	SRI VIJAYA	178.00	439	53282	24589	77871	393	159
17	WEERA - KEPPETIPOLA	183.60	454	107997	42422	150419	819	331
18	NAGAPURA SCHEME	310.50	767	150245	57358	207603	669	271
19	MAHASEN	316.00	783	284678	119999	404677	1277	517
20	EKSATH GOVI	112.00	277	125276	38332	163608	1461	591
21	VIJITHA	165.60	409	86892	28735	115627	698	283
22	PRAGATHI	124.00	308	96745	30625	127370	1021	414
	TOTAL	4382.01	10827	2660972	894462	3503434	17385.2	17035.71
amcdco		Average annual maintenence Cost 3,503,434/10827 =						324

ANNUAL MAINTENANCE COST OF DCOs SYSTEM - RIDI BENDI ELA SCHEME

DCO No.	DCO NAME	COMMAND AREA Ha	COMMAND AREA Ac	LABOUR COST Rs.	MAT/EQUP. TRANS. COST Rs.	TOTAL COST Rs.	UNIT COST PER Ha	UNIT COST PER Ac
1	KATAGAMUWA	245.00	605	146500	29300	175800	718	291
2	HAGALLEGAMA	129.00	319	21478	7160	28638	222	90
3	CENTER CANAL	161.00	398	63953	21318	85271	530	214
4	DANDUWANA	176.00	435	23959	7986	31945	182	73
5	TARANAGULLA	211.00	521	38215	12738	50953	241	98
6	DANGAWELAYAYA	197.00	487	71214	14243	85457	434	175
7	HEELOGAMA	113.00	279	12254	4084	16338	145	59
8	DIULLENA	209.00	516	38797	12932	51729	248	100
9	BUDUMUTTENA	238.00	588	48071	16024	64095	269	109
10	BALAGULLAGAMA	431.00	1064	77285	26428	105713	245	99
11	IBBAWELA	138.00	341	21392	7131	28523	207	84
	TOTAL	2248.00	5553.00	565118.00	159344.00	724462.00	3439.33	1392.13

Average Annual Maintenance Cost per Acre = 724,462/5,553 = Rs. 130

PROPOSED COST-EFFECTIVE PROCEDURE FOR IMPLEMENTATION OF REHABILITATION WORKS.

All construction works have to be executed according to the engineering specifications and the finished products be acceptable to the people in order to enable them tc operate and maintain the system components in a sustainable manner. At the active participation of the beneficiaries concerned should be ensured.

There should be harmony between the agency personnel and beneficiaries. Waste of resources should be minimized. Diversion of resources for personnel or on other unauthorized purposes should be avoided. Work should be completed in time . The completed works should be cost-effective in all respects. The agency personnel should be sincerely happy and fully devoted to serve in rural and difficult situations. The Project Management must be geared to steer the implementation to achieve the above minimum requirements. Therefore, the Consultant wishes to enumerate some possible reforms which will be needed in the implementing procedures.

o Once a rehabilitation project is conceived and accepted for implementation, awareness programs of the project should be conducted for the benefit all level of implementing agency personnel and for the people of the project area. This should be scheduled in a pragmatic manner so that no extra-ordinary efforts or procedures are involved.

The scale and scope of rehabilitation items should be made to known to all concerned parties during these awareness programs.

Implementation agency personnel should be hand-picked and posted to the project site at least one cultivation season prior to the commencement of rehabilitation works. These personnel should be resident in the near vicinity of the project area. Either temporary or permanent residential facilities may be provided depending on the nature of the project and cost allocation. It would be possible to rent or lease out private apartments for which the state should bear these costs.

Farmer organizations and the Project Management Committee in the schemes not functional in the proposed Scheme, these organizations should be formed adopting accepted strategies. Initially, the Project Management Committee which will mainly comprise of the field level Agency personnel can be formed without much ditticulty. The assistance of the experienced personnel from the ISMP, MIRP, MANISS and INMAS Schemes can be solicited for this purpose.

Suitable command area of the Scheme which should be representative of the average physical, social and technical aspects have to be selected as the "Pilot Project Area" in consultation with the Project Management Committee and the beneficiaries.

After proper propagation of the proposed project activities and benefits for the people of the Scheme, representatives of the farmers for each field canal can be elected.These representatives will be given simple training sessions by the Project Management Committee highlighting the basics of "Self Management of Irrigation Systems".

Modernization works of the Main System Components will be of great magnitude and will require special application of engineering skills in investigation, design, planning and implementation of modernization proposals. Therefore, it is suggested that this task should be entrusted to an experienced irrigation engineer or to a senior TA who should be fully autonomous and will function as the Resident Engineer for this purpose.(This practice was proved to be successful in the Gal Oya LB System rehabilitation and is being practiced in the Minipe LB System rehabilitation at present).

This Resident Engineer can handle more than one Scheme if there are several Schemes in the locations. The TAs and WSs will be deployed in a rotational basis to provide opportunities for all of them to get acquainted in construction, operation and maintenance and other systems management activities.

Walk-Through Operation and Maintenance Surveys of the Main System Components should be conducted by the TAs in-charge for the system with the participation of the IE, O& M Crew and relevant representatives of the beneficiaries. Based upon these surveys modernization proposals should be prepared, scrutinized by higher level personnel and approved for implementation.

Since there are obvious shortcomings in the present method of execution of works on contract through medium and small scale private contractors, it is recommended that either a large scale private contractor with good reputation is entrusted with the implementation or a suitable state construction agency may be offered this task. (For the Minipe LB System, the State Development and Construction Corporation was chosen by the sponsors of the Project).

If either of the strategies are not possible, the implementation may be undertaken on "Force Account" supplemented by Supplies Contracts for construction materials, plants and equipments.

The overall success of implementation will be dependant upon the efficiency and effectiveness of the Resident Engineer and his technical staff. Therefore, from the initial stages itself all strategies required for the successful implementation should be jointly worked out to maintain good spirit and enthusiasm among all staff. (For the implementation of Inginimitiya Reservoir Scheme and Kirindi Oya Reservoir Scheme, several incentive packages were offered to all ID staff).

High level ID staff should pay scheduled and unscheduled visits to the project areas and provide guidance and encouragement for the field level staff. (This aspect was very minimal in the ISMP Schemes).

In-Country and Third Country Training should be given to all field level staff without any discrimination. (In ISMP, many training courses and seminars were conducted for Colombo based Agency personnel.The Third Country Training Courses should be accessible to the different agency personnel in reasonable order to avoid frustration,to contain corruption and for proper motivation).

The modernization works in the Distributary Canal Systems will not be so extensive.Therefore, it is suggested that the entire command area is zoned into manageable units and TAs and WSs who are inclined to serve in these sub systems should be selected and posted.

These staff should organize small "Work Gangs" with the assistance Project Committee in each field canal level to implement modernization works on contract method.It can be mainly labor contract in most of the cases. However, if the "Work Gangs" are capable of mobilizing the materials required for their respective works, the whole work can be offered on contract to such "Work Gangs".

The modernization works in the Distributary Canal Systems involve stereo-type earthwork, masonry work and small scale plain concrete work. (Desilting, Formation bund with borrowed earth, Random rubble masonry and 1:3:6 cement concrete and turfing.)Therefore, on-site training can be provided to selected youths who can be selected from the same sub-system in order to assist the TAS and WSs in site supervision. The specifications pertaining to these indigenous nature of technology can be written in simple language on display boards for the benefit of all people concerned and these boards should be made available at all important work sites until the people become familiar with these processes. These youths should be paid wages from the

Project funds. (For agricultural extension work, volunteer farmers were trained and deployed in all ISMP Schemes and their performances are supposed to be adequate for the farmers).

This simple participatory approach will help to minimize wastage, corruption and will help to accelerate farmers' immediate problems by themselves. In addition, it will help to develop good civic-mindedness among many people. There will be better job satistaction among the ID staff and the reputation of the ID as an indispensable service organization will get enhanced.

The role small scale private contractors will be primarily limited to provide supplies of local construction materials.

However, if the DCOs are formed and strengthened in order to execute construction works on their systems with active participation of relevant people with absolutely genuine intentions, those DCOs should be afforded opportunities and they need to be facilitated and assisted by the ID staff in all aspects of management of construction contracts.

The above concepts are formulated based upon the first hand experience of the Consultant during the past fifteen years in different situations such IRDPs, VIRP, MIRP , Gal Oya LB System Rehabilitation Project, ISMP and the on-going Special Irrigation Development Project funded by EEC in the NWP. These concepts are aimed to fulfil the basic requirements quoted in the first paragraph of this synopsis. This concepts have to refined after presentation to the relevant personnel.