USAID/BELIZE

RURAL ACCESS ROADS AND BRIDGES

PROJECT NO. 505-0007

INTERIM EVALUATION OF BRIDGE COMPONENT

Date: March 25, 1988

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A C R O N Y M S .

A.I.D.	Agency for International Development
ESF	Economic Support Funds
GOB	Government of Belize
MOWH	Ministry of Works and Housing
PACD	Project Assistance Completion Date
PIL	Project Implementation Letter
RR&B	Rural Access Roads and Bridges Project
USAID	United States Agency for International Development

INTERIM EVALUATION OF BRIDGE COMPONENT

OF THE

RURAL ACCESS ROADS AND BRIDGES PROJECT NO. 505-0007

I. INTRODUCTION:

At the request of the Ministry of Works and Housing (MOWH) and USAID/Belize, the services of an A.I.D. engineer, Mr. Lynn Sheldon, from the Honduras Mission were secured to review the progress and problems associated with the bridge component of the Rural Access Roads and Bridges (RR&B) project, No. 505-0007, and to make recommendations. Mr. Sheldon was assisted by Dr. Gilbert H. Canton from the Belize Mission in conducting the evaluation and preparing this report.

The assessment took place from March 14 - 25, 1988. The assessment consisted of reviewing project documents, field visits and interviews with MOWH and USAID personnel and bridge contractors.

II. EVALUATION OBJECTIVES:

1. Assess progress of bridge construction activities in the bridge component of project.

2. Assess institutional performance in project monitoring, control of project resources and financial management.

3. Provide recommendations for establishment of a system for periodic reporting and evaluation of the bridge component of the project.

4. Determine Project's status in terms of full utilization of A.I.D. financed bridge commodities by Project Assistance Completion Date (PACD).

5. Provide recommendations for a plan to continue bridge construction activities.

III. PROBLEM DESCRIPTION

Bridge Sites:

The bridge sets obtained from excess property have been in Belize since December 1984. The components arrived in their original wooden boxes from Europe and many of the boxes literally crumbled to pieces as they were off loaded at the port in Belize City.

The 103 bridge sets were stored at the port until August, 1985 at which time a decision was made to create a bridge storage park in Hattieville. The bridge sets were subsequently moved to the new location.

Selection and Prioritization of Bridge Sites:

Under project auspices, rural roads in each district have been selected and prioritized for rehabilitation. In the first instance, some fifty four crossings, which qualified for upgrading to all weather status with project procured bridge sets, were identified on these project roads. Since the initial identification of crossings, the MOWH and USAID have prepared a "Bridge Allocation Report" which assigns bridge sets to crossings on project roads. After sufficing project road requirements, there remains a number of bridge sets which are not assigned to any specific site.

The MOWH has been conducting site investigations and preparing bridge designs and cost estimates for the crossings identified in the "Bridge Allocation Report".

Although bridge construction sites have been identified, the bridges to be constructed have not been prioritized by order for construction. Priorities and construction sequence for bridge construction are planned to be incorporated into a "Comprehensive Bridge Construction Plan" that has been discussed at length between the MOWH and USAID but not finalized.

The priorities established for road rehabilitation may not necessarily coincide with the priorities for bridge construction. For example, a road with high priority may have a bridge that is presently adequate while a road with low priority may have a crossing where a bridge does not exist, is washed out, or is so dilapidated that it is unsafe. Therefore,

the bridge on the low priority road would be of a higher priority for bridge construction than the bridge on the high priority road.

The lack of an established order of priority and construction sequence for bridge construction has apparently led to ad hoc selection of bridges for construction based on political and other considerations at that specific moment in time. For example, the bridges constructed and under construction in the Belize district were selected as first priority primarily because of the proposed large scale development plan for the area by Coca Cola Foods. Furthermore, the cost of the bridges were higher than originally estimated as the design criteria changed from single lane to two lane bridges to accommodate the proposed development.

For timely, orderly, and cost effective implementation of the bridge construction component, the MOWH and USAID have to develop and agree upon a priority list, design criteria (e.g., single vs. double lane), and construction sequence for bridge construction.

Bridge Construction and Associated Costs:

The first bridges constructed under the project were Sebastian, Bermudian Landing, Lemonal, Big Creek, Mullins River and Billy White. The total bridges to be built are about equally divided between large (70' or more) and small (17' to 30') applications. Most of the larger bridges are more than 100' in length. As a partial result, the costs of the completed structures have been much greater than expected.

As mentioned above, Sebastian, Bermudian Landing and Rancho Dolores, when completed, will provide all-weather access to the 50,000 acres of land purchased by Coca Cola to grow citrus and carryout associated processing. The construction of the final bridge in this three bridge sequence, Rancho Dolores, has been stalled since August 1987 due to lack of local funding. These bridges when completed will have cost on an average Bz$658,800. The cost is higher than might be expected because the bridges provide for two directional traffic. The width of the project rehabilitated road is wide enough for two vehicles to pass each other with caution and with the outside tires on the shoulder. The MOWH officials indicated a decision was made to construct two lane bridges accessing the Coca Cola land holding since heavy traffic loads were expected in both

directions when they were in full operation. There is still one bridge left to complete and the actual development of the 50,000 acres is still pending.

Bridge Construction Funding:

The MOWH originally was expecting a donation from another donor country to help cover the local costs of bridge construction. However, those funds never materialized and the only means to ensure that the program would start was through an allocation of Economic Support Fund (ESF) generated local currency funds. USAID and the Government of Belize (GOB) amended the Memorandum of Understanding on ESF local currencies to provide Bz$3,000,000 to the bridge construction effort. With a low probability for a future ESF program, ESF generated local currencies will not be available for further bridge construction. Some relief was provided in that a portion of the local currency proceeds generated under the Section 416 Sugar Quota Offset Program will be used for bridge construction in the Orange Walk and Corozal districts. Also, the GOB has placed Bz$800,000 in their Capital II Development Budget for bridge construction under the project. These funds, however, will still not be sufficient to complete the construction of all the bridges slated for construction under the project before the PACD.

Implementation of Bridge Construction Activities:

As indicated above, this element of the project has been plagued with continuous problems since its inception. Problem solving and timely implementation has been hampered by considerable misunderstandings and disagreements. For example, some individuals believe that bridge design standards are excessive and this is the reason costs have exceeded original expectations. Careful analysis of this issue indicates that bridge construction is oftenused by GOB politicians to gain the approval of their rural constituents or to satisfy the desires of prospective international investors. The results are; several two lane bridges on rural access roads, another bridge started and never completed and several built for a reasonable cost.

Several bridges have been wholly built by private contractors and two have been wholly built by the MOWH. In one case, Bermudian Landing, a contractual dispute between the Contractor and the Ministry led to a decision by the MOWH to terminate the contract and complete the bridge on their own.

The Project Paper and Agreement state that the private contractors will do the construction while the Ministry's Engineering Services Division will prepare the design and provide supervision. Apparently, this has not routinely occurred since, on several occasions, MOWH officials have received political pressure to start certain bridges immediately. The only way to respond to such a request without allowing for the necessary time for bid document preparation, proposal submission and review, and contract award was for the MOWH to construct the bridge by force account.

To further complicate the issues, on several occasions the cost of construction has exceeded the value of contracts or estimates.

To conclude, the MOWH does not foresee how financing will be secured to construct the remaining bridges utilizing all the bridge sets, by the end of the project, April 30, 1991.

IV. ASSESSMENT OF OBJECTIVES

1. Assess Progress of Bridge Construction Activities in the Bridge Component of the Project

Review of project documents indicates that this project was originally to be completed January 1, 1987. The project was extended without additional funding to June 30, 1987, and then later to December 31, 1987. An amendment to the project was executed in September, 1987 which extended the PACD to April 30, 1991 and provided additional loan and grant funds to the project. None of the loan or grant funds are earmarked for bridge construction activities. Furthermore, the Project Paper Amendment dated September 30, 1987, does not list completion of fifty-four bridges as a Logical Framework Output, however, the text discusses trying to complete ten bridges by mid-1988 and notes that the design has been finished for eleven additional crossings.

In August, 1987 an audit of the USAID/Belize Portfolio and Operating Expenses cited several areas where project implementation and management of commodities could be improved. Two project evaluations have been held, and both reported minimal progress in the installation of the fifty-four proposed bridge crossings.

Review of this element of the project indicates the activity is not even close to meeting its original objective of fifty-four crossings. Discussions with the MOWH Chief, Engineering Services Division, responsible for bridge design, indicate that his department would commence the design of new bridges if he knew the order of priority and if funds would be available to do the construction.

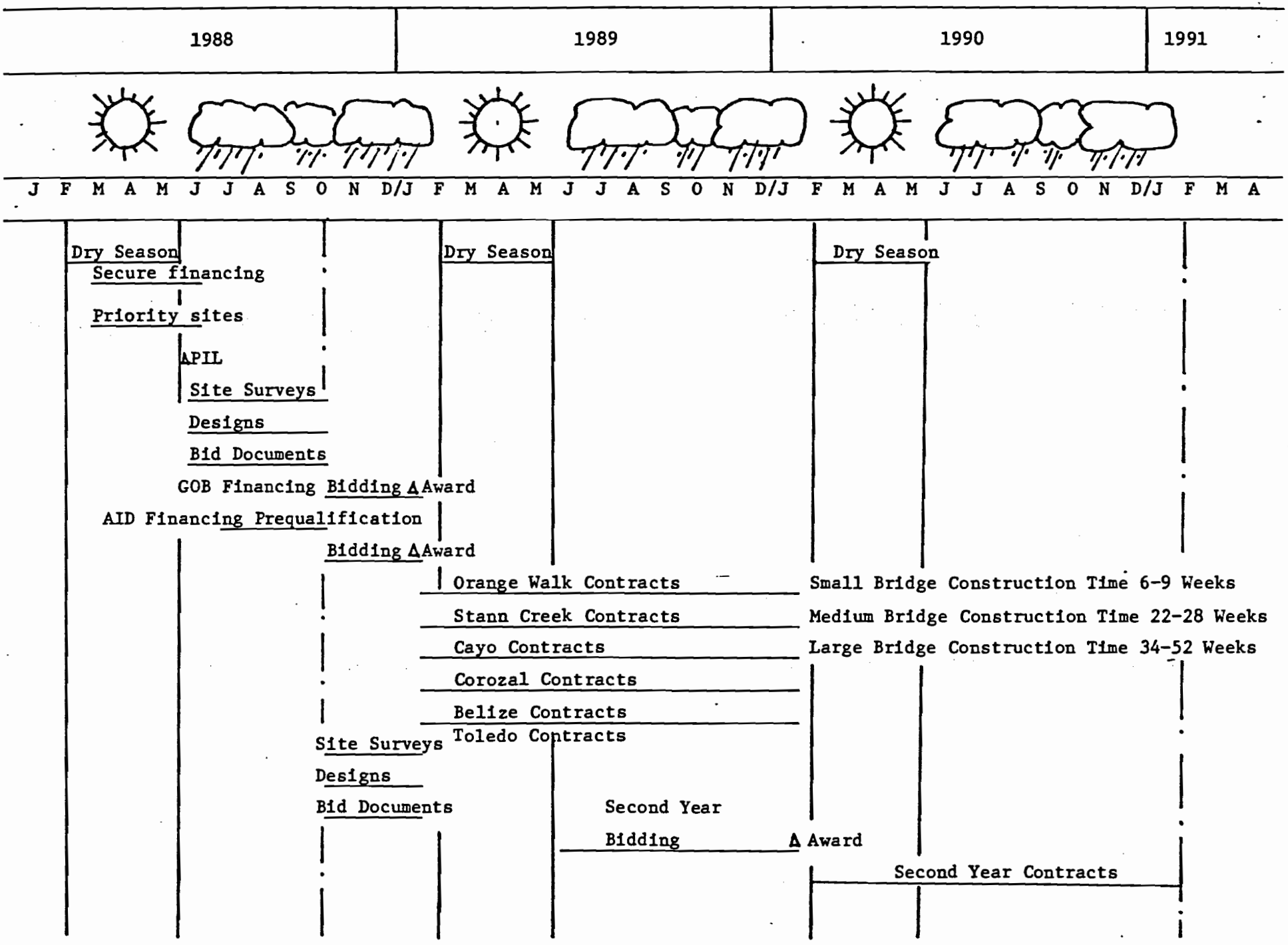
In general bridge construction in Belize should start between January 15th and March 1st to take advantage of the dry season (February-May). The first crucial construction activity is pile driving. The bridge contractors believe if they can get the piles driven and abutments started in the dry season they can continue construction during the rainy season, since they will be able to keep ahead of the rising river levels. In order to commence construction between January and March it is obviously necessary to have previously completed all contracting actions. In practice, if all of the activities can be put into cycles each individual activity will be more manageable. (See Schedule No. 1: Illustrative Implementation Plan).

To highlight the importance of starting the bridge construction at the beginning of the dry season the following cases are cited:

Sebastian - This bridge was started by MOWH as a force account project in April 1986. The site was soon mobilized and activities were commencing well. Flooding during the last week of May 1986 caused a delay of two and a half months because the entire site was under water. After flooding, work recommenced and the bridge was finished in August 1987 (approximately 70 weeks after starting).

Bermudian Landing - This bridge was started under contract and finished by force account due to a contractual dispute between the MOWH and the contractor. The contract was signed April 23, 1986. Again the May flooding in the area created problems for the contractor. To further complicate the situation, the ferry at Bermudian Landing sunk on May 27, 1986 and was never refloated. The ferry was finally replaced in late November 1986. Because the contractor was depending on the ferry to move commodities and equipment across the river he was delayed for almost six months. The bridge was finally completed by the MOWH, in December 1987, 85 weeks after starting construction.

Schedule No. 1: Illustrative Impelemntation Plan



Rancho Dolores - This bridge was started May 1986. Again, since it is in the area where heavy flooding occurred in 1986 this force account project was also delayed. This particular river's flood waters did not subside as quickly as the other rivers and construction was postponed even longer. Additionally, a decision was made by the MOWH to continue construction of Rancho Dolores only after Sebastian bridge was completed.

Sebastian was completed in August 1987 and work re-commenced at Rancho Dolores in July 1987. The reinforcing steel was prepared at Burrell Boom and moved to the site in July 1987. Shortly afterwards another decision was made to further postpone construction. Thus far, there are two piles driven, a bridge approach on one side of the river and many materials such as bridge parts, reinforcing steel, formwork, etc., on the site. Meanwhile, the MOWH is spending approximately Bz$700 per week for on site guard service. There are presently no immediate plans to re-start construction. The MOWH states that some of the Bz$800,000 recently allocated in the Capital II Development Budget for bridge construction will be used to complete the Rancho Dolores bridge.

Lemonal - This bridge is accessed by the Sebastian and Bermudian Landing bridges. As mentioned previously, the sinking of the ferry at Bermudian Landing stalled construction. This site was mobilized by the contractor, May 8, 1986. Construction on this site was impeded until the ferry at Bermudian Landing was operable in late-November 1986. As the contractor gained momentum, he was ready to start steel erection in mid-August 1986. At this point he asked the MOWH to provide the steel erection supervision as provisioned in the contract. The MOWH asked him to wait and they would inform him as to their decision. Finally, in mid-November 1987 the contractor was informed he could proceed with steel erection and did not need continuous on-site MOWH supervision. The bridge is still under construction and should be completed in early April 1988 (approximately 92 weeks after starting).

Conclusion:

The MOWH was forced to deal with some very difficult issues related to the construction of these four bridges primarily because of the time of the year that construction began. Had they started work two or three months earlier the bridges would have been completed much sooner, they would have avoided most

of the problems associated with flooding and they may have been able to complete Rancho Dolores bridge before other Ministry priorities used the funds.

2. Assess Institutional Performance in Monitoring, Control of Project Resources and Financial Management

Assessment of the MOWH contracting procedure shows contracts are provisional sum contracts. In effect, these are measurement contracts. In essence, the MOWH is gambling that their estimate is accurate enough to stay within the allocated contract budget. The contractors like these contracts because there are a large number of unknowns, and if the quantity of work is larger than the MOWH estimate they know they will be paid for the additional effort. The contract documents are composed of Specification, Conditions of Contract, Bills of Quantities and the Construction Drawings. Review of these documents indicates that a reasonable process for contracting bridges has been established. Inspection of a representative sample of the bridges, due to limitations in time, (Sebastian, Bermudian Landing and Lemonal) confirms that the construction is satisfactory.

An area of financial management that warrants review is the process in making additional funds available when a contract goes over budget. This is not a clear cut issue. A.I.D. normally works with fixed price contracts and views approval of contract price as the maximum cost of the work. The provisional sum contract, in effect, can exceed the total contract price if the actual measurements exceed those estimated.

Another area of financial control that could be improved is the determination of costs associated with individual bridges. It appears that while close control is maintained for the total bridge effort, separation to individual bridge efforts is unclear. The MOWH and USAID should establish a system, probably on the computer, for cost control on an individual bridge basis.

Discussions with the MOWH Chief Engineer and Chief, Engineering Services Division, ascertain that both individuals are quite capable and, with funding, could fully implement the bridge building component of the project. However, the Engineering Services Division is short staffed if a major effort is to be placed on bridge design and construction supervision. The MOWH

has numerous other projects which compete for the limited staff and resources. It may be necessary that additional staff be hired on an open vote, short term basis if the bridge program is to receive a major acceleration.

Discussions with several private bridge contractors verify that the associated MOWH officials have adequate expertise to provide necessary direction to the bridge building effort during design and contract implementation.

The contractors, by and large, are satisfied with the responsiveness of the MOWH in terms of processing pay vouchers and conducting timely site inspections.

Conclusion:

Institutional capability is probably adequate to maintain program effort as presently being implemented. However, if program is to be accelerated then institutional capability will have to be augmented, especially at the focal point, the Engineering Services Division.

Lack of adequate financing is the major issue associated with completing the bridge crossings. According to the Project Agreement, the GOB is responsible for providing funds for bridge construction as part of the Host Country Contribution. ESF local currencies have been the major source of bridge construction financing, but this source is no longer available for additional financing above the level already allocated. The GOB will have to identify new sources of funding for bridge construction. The lack of sufficient funds is the most critical constraint to completion of the bridge construction prior to PACD.

3. Provide Recommendations for the Establishment of a System for Periodic Reporting and Evaluation of the Bridge Component of the Project

The present system for reporting on the bridge component is mainly through oral briefings. Although the MOWH engineers at the technical level are very aware of day to day progress and are able to obtain quickly most information sought by the Permanent Secretary, and other MOWH officials, there is felt a need to formalize the information transfer regarding activities of the bridge component.

Formal reports, probably on a monthly basis, should be developed and distributed among the responsible MOWH and USAID officials. The reports should contain the necessary information for effective monitoring and control data can be entered into the Ministry's micro-computer to make periodic updating easier. Utilization of computer programs available such as Time Line, Micro-Soft Project Manager, Lotus 123 and dBase III+ will improve project management. Attached is a sample data format that could be completed and routinely updated (Schedule 2). In addition, financial expenditures can be recorded to track drawdown on contracts. An example of the type of data that could be useful for MOWH upper management is attached (Schedule 3).

Conclusion:

Present reporting on bridge construction activities does not adequately meet the requirements of the agencies involved to provide effective monitoring and control. While the information is available it needs to be compiled and reported in a form useful to management. It is recommended that USAID provide short-term technical assistance to the MOWH to establish useful reporting and tracking procedures.

4. Determine Project's Status in Terms of Full Utilization of USAID Financed Bridge Commodities by the Project Agreement Completion Date

The MOWH has built two bridges under force account and have finished one (bridge steel erection) started by a contractor due to a contractual dispute. Conversations with MOWH officials indicate they have plans to construct Orange Walk and San Roman Bridges utilizing force account administration since they claim there is not enough time to utilize the bidding process if construction is to be realized in 1988. Interestingly, there are four bridges that have been bid and award of contract held because of insufficient funds. Project Agreement Amendment No. 4 dated September 30, 1987, in the Amplified Project Description states, "...Phase II construction and installation will be carried out by private contractors who are prequalified and have demonstrated their competence. The role of the Bridges Division will be in the design and supervision of the additional crossings and the maintenance and repair of all bridges..." Discussions with MOWH officials acknowledge there is a competence in bridge construction by

Schedule No. 2: Periodic Project Status Report

Rural Roads and Bridges Site	Soils analysis completed	Bridge design underway	Bridge design completed	Cost estimate underway	Cost estimate prepared	Bidding				Estimated Cost of Construction	Contract Award price	Actual Cost of Construction	Date Construction started	Date Constr. Completed	Railway I-Beam 17'	Railway I-Beam 21'	Railway I-Beam 27'	Highway Fixed Steel Span 30'	Highway Fixed Steel Span 60'	Railway Deck Type Girder 70'	Railway thru Type Truss 70'	Highway thru Truss 90'	Additional Remarks
						Documents prepared	Advertised	Evaluated	Awarded														

Schedule No. 3: Periodic Contract Summary Report

Contract: San Antonio (Example)

Contractor:

Date of Contract:

Date of Update:

Months into Implementation:

Contract Period:

Percentage of Work Completed:

General Summary of Bills of Quantities

Activities	Contract Price	Expenditure Paid to Date	Funds Remaining	Estimated Date of Completion
1. Preliminaries				
2. Earthworks a. b.				
3. Pile Driving				
4. Pier Construction a. b.				
5. Abutments a. b.				
6. Bridge Structural Seel Erection				
7. Bridge Deck				
8. Railwork				
9. Metal Cleaning and Painting				
10. Provisional Sum				
TOTALS				

numerous local contractors. It was stated by one MOWH official that there are at least eleven local contractors that have the capability to build medium and large size bridges. Whereas there are four or five more who could qualify for the small size bridges.

A decision needs to be made to utilize purchased project commodities, namely use the 103 bridge sets by the end of the project or liquidate the commodity through established A.I.D. procedures. Bridge construction is a high priority since the bridges are needed to provide all weather access to agricultural lands.

The MOWH has confirmed, if funds are available, it is possible to utilize all bridge sets by the PACD, April 30, 1991, utilizing private sector contractors. The contracts should be offered in packages as large as possible in order to obtain the lowest prices per bridge and afford local contractors an opportunity to improve their operations. A bridge package could consist of four to twelve bridges depending on the level of complexity and the value. MOWH officials indicate many small packages will be the most palatable to the GOB since it will give more opportunity to more contractors. This approach will increase the contract administrative burden on the MOWH.

Historically, the following gives an accounting of bridge progress to date:

Site	Method of Construction
Big Creek	MOWH (completed)
Billy White Creek	Contractor (completed)
Mullins River	U.S. Army Corps. of Engineers with the MOWH providing materials (completed)
Sebastian	MOWH (completed)
Bermudian Landing	Contractor and completed by MOWH (completed)
Rancho Dolores	MOWH (suspended)
Lemonal	Contractor (under construction)

Juan Chun	Contractor (under construction)
Crique Jute	Contractor (under construction)
Rio Blanco	Contractor (under construction)

The most logical approach to completing the bridge component of the project is to have the MOWH contract with local contractors capable of building the structures. It is not in the best interest of the project to have the MOWH implement under force account administration since they are not committed to a contract they may start but never finish a bridge due to other MOWH priorities for limited funds. Rancho Dolores is an example of this. The bridges should be grouped in large contract packages to allow one contractor for the package to spread his profit over numerous bridges and thus the profit margin on each is reduced and therefore more bridges can be built for the same amount of money. Also, this will provide contractors an unique opportunity to look toward the future and use the bridge construction as a stepping stone toward increasing their size and improving equipment. This is possible because the uncertainty of how much work their firm will have for the next year or two will be removed and it is expected they will more readily make capital improvements.

In general, the road approaches for the bridges should not be combined in the same contract with the bridge work. The reason being, road approaches are very straight forward and simple works. Also approaches can easily be done by the MOWH who already has the equipment or by a small contractor who may not qualify for bridge erection but can satisfactorily build embankments. This is to the advantage of the project because the small contractors have much less overhead than the larger firms and will cost less per unit of quantity. The MOWH would do the work only if their cost estimate for force account is considerably less than that of the small contractor. The exception would be, road approaches for the small bridges (17'-30' spans) since it would not be worth the administrative burden to monitor the road approach and bridge construction under two contracts.

In the event USAID loan funds are used directly for local construction, firms will have to be prequalified again to comply with A.I.D. criteria. Also, it may be necessary to modify the type of contract.

As of this writing the MOWH has not finalized a listing that would detail the number of bridges remaining to be built, to in effect, fully utilize the USAID financed bridge commodities. It is suspected the numbers are: five-completed; four-under construction; one-stalled (Rancho Dolores); thirteen-designed and thirty-one remaining to be designed. Of the thirty-one bridges remaining, there are thirty-six bridge sets available.

It is highly likely if all the bridge sets are utilized the final total of bridges constructed will be less than the original target of fifty-four bridges. This is because several sets may be combined for one bridge. Of those bridges designed or approved for construction five are utilizing 17' bridge sets; one is utilizing six sets of 21'; three are utilizing 27' and 30' bridge sets; two are utilizing a single 70' span each; and one will utilize two spans of 70'.

The MOWH rough estimated cost of construction of the designed bridges is approximately Bz$2.0 million. If the remaining thirty-six sets are utilized as single spans a rough cost estimate for construction is Bz$4.0 million. In summary an approximate total of Bz$6.0 million is required to complete the bridge building program.

Conclusion:

USAID and the MOWH should more aggressively pursue and finalize financing arrangements to assure that the bridges will be constructed prior to the project PACD. Simultaneously, a comprehensive bridge plan that sets forth priorities, construction schedules, contracting mechanisms, etc., should be finalized as soon as possible. Having an established plan agreed upon by both USAID and the MOWH will insulate the activity from political and other interference which would attempt to influence priorities and contracting mechanisms. The present rate of construction will precipitate the situation that at PACD project commodities, i.e., bridge sets, will not have been fully utilized. A project completed without all commodities utilized is not a desirable situation to be in. All effort should be made to avoid such a situation.

5. Provide Recommendations for a Plan to Continue Bridge Construction Activities.

Recognizing that the GOB and USAID have entered into an agreement that requires utilization of purchased commodities by

the PACD of April 30, 1991, it is apparent there is a great deal of work remaining. Recommendations for future construction follows:

(A) GOB and USAID agree to dedicate adequate funding to bridge construction.

(B) Bridges to be built are prioritized by MOWH and list discussed with USAID with selected bridges identified in a Project Implementation Letter (PIL).

(C) Prepare a comprehensive plan for: (a) design schedule and (b) contracting and construction.

(D) Finalize designs for those bridges already designed and prepare bid documents, obtain proposals and evaluate and award contracts.

(E) From prioritized list determine those sites requiring site survey, design and bid documents. These will be prepared for first and second year's dry season construction startups. Review existing site surveys for accuracy and thoroughness.

(F) Utilize contractors to build bridges and contractors or MOWH to build access approaches. It is important to contract separately the approaches and bridge at the same site. (The exception could be small bridges with minimum work on approaches).

(G) Newly financed technical assistance personnel will assist MOWH as appropriate.

(H) Ensure all bridge commodities are in a secure area.

(I) Establish a bridge maintenance and repair program.

As mentioned above the major constraint to the completion of the bridge construction activities by PACD is the lack of adequate funding. It appears highly unlikely that the GOB will be able to come up with the necessary financing from their own sources to meet their commitment. Several options should be

explored by USAID and the GOB to secure the necessary funding to complete the activity. These options are summarized as follows:

Option No. 1:

The GOB assigns the necessary funds to construct the remaining bridges. These funds can be allocated through the Capital II budget. Local currencies generated under the Sugar Quota Offset Program should be allocated by the GOB to construct all the bridges in Orange Walk and Corozal districts. Bridges in the remainder of the country will have to be constructed with funds from within the GOB resources or from funds secured from other donor agencies.

Option No. 2:

USAID request an increase in funding from AID/Washington probably on the basis that the GOB cannot come up with the funds to fullfill their commitment .

Option No. 3:

The GOB seeks funding for bridge construction from other external donors, e.g., World Bank.

Option No. 4:

As a last resort USAID and the GOB will have to consider reallocating sufficient funds within the recent amendment to the bridge activity to assure that bridges are constructed by PACD.