UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D. C. 20523

CARIBBEAN REGIONAL

PROJECT PAPER

DOMINICA ROAD REHABILITATION

AID/LAC/P-108/1

Project Number:538-0076

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: C (A = Add, C = Change, D = Delete) — Amendment Number: 1 — DOCUMENT CODE: 3

2. COUNTRY/ENTITY: Regional Development Office/Caribbean

3. PROJECT NUMBER: 538-0076

4. BUREAU/OFFICE: Latin America and the Caribbean (LAC) 05

5. PROJECT TITLE (maximum 40 characters): Dominica Road Rehabilitation

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 06 DD 30 YY 86

7. ESTIMATED DATE OF OBLIGATION (Under "B." below, enter 1, 2, 3, or 4): A. Initial FY 82 B. Quarter 4 C. Final FY 85

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L/C	FIRST FY D. Total	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L/C	LIFE OF PROJECT G. Total
AID Appropriated Total						
(Grant)	(14,900)	( )	(14,900)	(14,900)	( )	(14,900)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
Host Country						
Other Donor(s)						
TOTALS	14,900		14,900	14,900		14,900

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	C. PRIMARY TECH. CODE 2. Loan	D. OBLIGATIONS TO DATE 1. Grant	D. OBLIGATIONS TO DATE 2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	E. AMOUNT APPROVED THIS ACTION 2. Loan	F. LIFE OF PROJECT 1. Grant	F. LIFE OF PROJECT 2. Loan
(1) ESF	701	821		9.6		5.3		14.9	
(2)									
(3)									
(4)									
TOTALS				9.6		5.3		14.9	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 061

11. SECONDARY PURPOSE CODE: 133

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code							
B. Amount							

13. PROJECT PURPOSE (maximum 480 characters)

To provide dependable access from Dominica's capital and major port to the agricultural areas of central and eastern Dominica and the international airport.

14. SCHEDULED EVALUATIONS: Interim MM YY MM YY; Final MM YY

15. SOURCE/ORIGIN OF GOODS AND SERVICES: [X] 000 [ ] 941 [ ] Local [ ] Other (Specify) _____

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment)

17. APPROVED BY — Signature: Terrence J. Brown — Title: Acting Director RDO/C — Date Signed: MM 01 DD 08 YY 85

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

AID 1350-4 (8-79)

PROJECT AUTHORIZATION AMENDMENT

Name of Country : Commonwealth of Dominica, West Indies

Name of Project : Dominica Road Rehabilitation

Number of Project : 538-0076

The purpose of this Amendment is to increase Project funding by $5,300,000 in grant funds for a new total Life of Project funding level of $14,900,000.

1) In Paragraph Number 1 of the Project Authorization, delete "Nine Million Six Hundred Thousand United States Dollars ($9,600,000)". Replace with "Fourteen Million Nine Hundred Thousand United States Dollars ($14,900,000)".

2) In Paragraph Number 1 of the Project Authorization, delete "a forty month period" and replace with "a forty nine month period".

3) In Paragraph Number 2 of the Project Authorization, delete period and add to end of text "With dual lane bridges, and the replacement of a third bridge Tarou, with a box culvert".

4) All other provisions of the Project Authorization remain in force.

Acting Mission Director
Regional Development Office/Caribbean

9 1985

Date

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DOMINICA ROAD REHABILITATION

PROJECT PAPER AMENDMENT

I. SUMMARY AND RECOMMENDATION

A. Recommendation

RDO/C recommends that AID grant an additional $5.300,000 to the Government of the Commonwealth of Dominica for the Dominica Road Rehabilitation Project for a Project total of $14,900,000, and that the Project Activities Completion Date (PACD) be extended from the present date of September 30, 1985 to June 30, 1986.

B. Project Description

The Dominica Road Rehabilitation Project was authorized on August 24, 1982 in the amount of $9.6 million with a project completion date of September 30, 1985. This amendment proposes an increase of $5.3 million and a ten month extension of the PACD to June 30, 1986.

The purpose of the Project is to provide dependable road access from the capital city to the agricultural areas of central and eastern Dominica and the international airport. The Project finances the rehabilitation of 30.5 miles of road from the capital city of Roseau to Hatton Garden on the east coast.

There has been progress toward meeting the objectives of the Project. The construction of piers and the fabrication of steel for the bridges is underway, the installation of pipe culverts and construction of ditches is in progress, patching of the road surface continues, and gabion wall construction between Roseau and Pont Casse is nearing completion

However, unanticipated developments have caused project costs to increase:

- Rapid deterioration of the road pavement and drainage structures which occured after the technical design was presented, coupled with inadequate maintenance on the existing road, compounded the need for design changes during construction. Quantity increases due to deterioration of the pavement and drainage structures, as well as underestimates of the original materials quantities, has resulted in about $2.8 million in additional costs.

- In order to provide the twenty-year pavement which was originally envisioned in the Project Paper, and which has been requested by the Government of the Commonwealth of Dominica (GOCD), a substantial increase in quantities of base and surface courses has resulted in a cost increase of $1.6 million.

- The funding allocated for bridge construction is inadequate because steel procured under AID's Excess Property program did not meet the required specifications. The need to redesign the Canefield Bridge and to procure additional steel results in about $400,000 in additional cost.

- Landslides due to the heavy rains in November 1984 made parts of the project road impassable, and will require additional effort to remove landslide material and restore roadway embankments. Approximately $243,000 will be added to the contingency to permit change orders related to these repair activities to be payable from the contingency.

  Supervision of additional activities as well as some additional services provided for existing activities, will require additional time. An amendment adding $257,000 to the engineering supervision contract will be paid from the contingency.

No new road sections or other additions to the Project are planned. The proposed project amendment will cover increases resulting from deterioration that occured subsequent to design and an underestimate of the original quantities of material and of work to be done. The increased funding will also meet the costs of strengthening the base and surface of the Roseau-Layou section to a twenty year pavement life.

Waivers to permit sole source procurement of the services of the present consulting engineer, Louis Berger International, Inc. (LBII) and of the construction contractor, Nello L.Teer Company (NLTC), have been approved by the Assistant Administrator of the Latin America and Caribbean Bureau, and by the Administrator of AID, respectively, so that these contracts may be increased in value and supervision and construction therefore can proceed without interruption.

II. BACKGROUND

A. Project Activities

The Project Description for the Project Amendment is virtually unchanged from the original Project Paper. The USAID financed Project consists of the rehabilitation and reconstruction of three sections of road totalling approximately 30.5 miles, and the replacement of three bridges.

1) Section #1 - Roseau to Layou

This 8.3 mile road, which varies in width from 16 ft. to 24 ft., passes from the capital city of Roseau to the Hillsborough Bridge at Layou. The section includes two single lane steel truss bridges. The Project finances the:

a) installation of new drainage structures,
b) improvement of sea defences,
c) widening and reconstruction of pavement,
d) replacement of the single-lane bridges at Canefield and Hillsborough with double-lane bridges.

2) Section #2 Layou to Pont Casse

This 7.7 mile section passes from the Hillsborough Bridge at Layou to the major interior crossroads at Pont Casse. The road width varies from 12 ft. to 18 ft. The Project finances the:

a) installation of new drainage and retaining structures,
b) widening and overlaying of the existing pavement

3) Section #3 Pont Casse to Hatton Garden

This 14.3 mile section passes from Pont Casse to the east coast, just south of Melville Hall International Airport. The terrain is mountainous with heavy, frequent rainfall which results in landslides. The road is approximately 10 ft. wide. The Project finances the:

a) installation of drainage structures,
b) placement of gabion walls
c) widening and overlaying of the existing pavement.

B. Project Activities Status as of November 1984

During the year that has passed since construction activities began, considerable progress has been made despite a number of delays:

1) The substructures of the Hillsborough and Canefield bridges are nearing completion;

2) fabrication of structural steel for the Hillsborough and Canefield bridges is in process;

3) drainage improvements for Sections #1 and #2 are nearing completion, and are underway on Section #3;

4) gabion wall construction is estimated to be 50% complete,

5) preparation for beginning pavement operations are underway.

C. Historical Perspective

The USAID funded project is part of the $40 million dollar 1982-1985 Dominica Emergency Road Program's Road Maintenance and Rehabilitation Project. The Program is managed by the GOCD's Ministry of Communication and Works (MCW). Other donors include the Canadian International Development Agency (CIDA), the European Economic Community (EEC) through the EDF, the Caribbean Development Bank (CDB), the OPEC fund for International Development, the British Development Division (BDD), and the International Development Association (IDA). As a result of the multi-donor program adopted in November 1981, USAID agreed to finance the reconstruction of the main east-west road from Roseau to Hatton Garden totalling 30.5 miles, and the replacement of two major bridges.

The preliminary design for the USAID project paper was prepared by Curran and LeBron Associates, and the $9,600,000 project was authorized by the Mission Director on August 24, 1982. The construction budget was $6,464,000 for road rehabilitation plus $1,027,000 for bridges replacement, for a total of $7,491,000. $469,000 was allocated for engineering services, and $1,640,000 was allocated for the 20% contingency.

Amendment #1 to the Project Financial Plan (Annex I of the Project Agreement) was approved on January 28, 1983 to increase the amount for the engineering design/construction supervision contract. In February Louis Berger International (LBII) was awarded the engineering design and supervision contract by the GOCD, using Handbook 11 procedures. This thirty month cost reimbursable/fixed fee contract was for $897,556. Amendment #1 (and LBII's contract) also included $11,150 to cover the cost of soil testing equipment for the GOCD. The total additional amount for the LBII contract, $428,000, was taken from the 20% contingency of $1,640,000, leaving a 16% contingency or $1,212,000.

On February 18, 1983 RDO/C approved the GOCD's request to replace the two single lane bridges with dual lane bridges, and to undertake the reconstruction of a third bridge, Tarou, with a box culvert (IL#7). Implementation Letter #7 also confirmed RDO/C's intention to acquire bridge units from the Excess Property Program. The budget amount allocated for bridge replacement remained as it was in the Project Paper, $1.027,000.

LBII prepared the engineering design and estimated that the project cost, if designed to the specifications of the Project Paper, would total $10.6 million, including a contingency of $1 million. Yet the available construction budget, based on the total project authorization of $9.6 million, was only $7.491 million. Hence the design was modified to stay within the

construction budget. Based on the evidence available at the time, the Mission concluded that the revised LBII design was adequate and approved it in May 1983.

The construction contract was awarded to Nello L.Teer Company (NLTC) on August 3 and signed on September 8, 1983. NLTC's bid of $7,651,423 ($6,186,000 for roads, $1,305,000 for bridges) was $160,423 over the amount allocated for road rehabilitation and bridge replacement in the Financial Plan of the Project Agreement. The Project Agreement was amended (Amendment #2) on August 3, and this minor increase was taken from the contingency line item.

Amendment #2 included an additional $141,000 taken from the contingency to cover the cost of steel that was purchased from the Excess Property Program for bridges construction. The components of the used prefabricated bridge which was supplied by the GOCD as part of its counterpart to the project proved unusable because of their deteriorated state. The $160,423 bid plus the $141,000 for excess property amounted to approximately $302,000, which was taken from the contingency, leaving $910,577, or 9% for contingencies.

By the end of December 1983, the erection of construction site offices was completed and surveys to establish the center line/reference points of the project road were underway. By the end of March 1984, NLTC construction mobilization was about 85% complete, and the clearing and grubbing of the approaches to the three bridge sites was completed. However, LBII's final design preparation had delayed the project by two months, and construction was increasingly behind schedule. A variety of problems, as discussed in the next section, resulted in increased costs and disrupted orderly implementation.

Moreover, the contingency, which was meant to provide a cushion against unforeseeable events, had been steadily eroded. Approximately $152,660 was required for relocating utilities and clearing ditches, for which the Dominica utilities company requested financial assistance (see D.1. below). RDO/C approved paying this amount from the contingency in Project Agreement Amendment #3, on April 12, 1984. Additionally, $25,000 was due the GOCD in December 1982 for clearing and grubbing operations prior to the mobilization of the construction contractor, thus reducing the contingency further to $757,340.

By November 1984, RDO/C had also approved paying approximately $112,000 for day works (change orders), and had tentatively approved a $241,000 increase to the LBII contract. These sums are to be taken from the contingency, which will thus be reduced to $379,340. Table I illustrates the changes in line items as the amendments were enacted:

Table I: Summary of Project Budget

	PP	Amendment #1	Amendment #2	Amendment #3	Current
LBII	469,000	897,000	897,000	897,000	1,138,000
NLTC Bridges	1,027,000	1,607,000	1,607,000	1,607,000	1,607,000
NLTC Roads	6,464,000	6,464,000	6,186,000	6,338,660	6,475,660
Contingency	1,640,000	1,212,000	910,000	757,340	379,340
Totals	9,600,000	9,600,000	9,600,000	9,600,000	9,600,000

Subsequent developments in 1984 have made it imperative that RDO/C request additional funds. In May it was established that the steel procured from the Excess Property Program would require refabrication, and that the bridges would have to be redesigned for an additional cost of $400,000. Also in May, it was discovered that deterioration of the road due to a number of factors, as well as LBII's miscalculations (see D.5 below), would require approximately $2,800,000. In September the GOCD requested that the road section #1 pavement be strengthened, for an additional estimated cost of approximately $1,600,000 (see D.6 below).

The Mission had weighed the alternatives, which were to complete section #1 to a twenty year pavement life, and as much of the remaining two sections as possible with existing funds; or to request additional funds in order to complete the entire road. The first alternative was politically unfeasible, and the Mission proceeded to request $4.8 million in additional funds.

Then, heavy rains in November 1984 caused mudslides which will have to be cleared from the roads, along with other damage. The GOCD requested emergency assistance. The Mission proposes that $500,000 be added to the contingency to cover the anticipated costs of change orders (see D.7 below), thereby permitting $257,000 to be used from the existing contingency to cover an amendment to the contract for supervisory services. The total additional amount requested is therefore $5.3 million.

D. Expanded Description of Specific Implementation Problems

1) Relocation of utilities

The center line surveys completed by LBII had shown that the water distribution lines which had been installed by the GOCD over the previous two years along road section #1 (Roseau to Layou) interfered with the rehabilitation of the drainage of the road, and also that the existing water main would obstruct placing about 21 culverts along the road. Under the GOCD's host country contract with NLTC, the GOCD had agreed to adjust such utilities at its own cost.

However, by mid January 1984, the GOCD stated that it was unable to finance the costs of relocating the lines, and announced its intention to ask AID for additional financial assistance. LBII advised the GOCD and AID that the cost of constructing the ditches by hand work, and the redesign and relocation of the culverts around the existing water mains would cost an estimated $152,660. On February 21, the GOCD formally requested the additional funds. In April, the Mission agreed to fund the GOCD request, which came out of the contingency.

2) Staff changes by LBII, the GOCD, and NLTC

Four of the principal members of the LBII construction supervison staff, including the project manager, had been replaced by the end of 1983. The GOCD's Minister of Communications and Works resigned and the Chief Technical Officer of the MCW has been replaced twice. The NLTC project manager left in August 1984, and was replaced. As a result, there was little continuity in project management.

An August 22, 1984 cable to AID/W (Bridgetown 05913) cited the overburdening of the MCW project unit. This staff of four professionals, including the minister, was expected to manage four separate donor projects associated with Dominica's road rehabilitation effort. In part as a result of an overburdened MCW staff, the GOCD did not submit NLTC's invoices for payment on time, and when submitted, the invoices were often incorrect.

3) Additional costs associated with bridges

By May 1984, it had been established that the steel beams supplied from the Excess Property Program for use in replacing the Hillsborough Bridge could not be used without further fabrication by the construction contractor, and that the bridge would have to be redesigned and more steel purchased at additional cost to the Project.

The used prefabricated bridge supplied by the GOCD for use at Canefield had deteriorated to such an extent that it could not be used. The total cost of fabricating and replacing bridge material is expected to be over $400,000, in addition to substantial time lost due to these unforeseen events. This additional cost will be paid from the proposed additional funding.

4) Shortage of aggregate

NLTC has been in competition with the construction contractors on the other donor-funded road projects for aggregate required for concrete, base course, and asphaltic concrete. NLTC issued purchase orders to a local firm for total job requirements, but as of September the local supplier had produced only a small amount of acceptable material. In October 1984, the local contractor had mobilized additional workers and equipment for drilling and blasting in the new quarry, and was expected to begin production by the end of the month. Nevertheless, under the circumstances, NLTC has made the determination to mobilize its own crusher, which has now been shipped.

5) Deterioration of the Road and LBII error in the Bill of Quantities

By May 1984 it was known that there would be an estimated increase in project costs to cover 1) the additional costs that had been incurred because of the deterioration of the road since the time of the original design, and 2) the miscalculation by LBII with regard to the quanitities for hillside excavation and other items in the Bill of Quantities.

The existing roads deteriorated at a faster rate than anticipated because of heavy rains, lack of routine maintenance by the MCW, the slow rate of construction by NLTC, and heavy construction vehicle traffic. In July 1984, LBII estimated that 68% of the increase required for reconstruction was due to deterioration of the road since the project was originally designed, and 32% to additional hillside excavation and related works (i.e. the result of LBII's initial miscalulation). The total cost of compensating for deterioration and for LBII's underestimation is expected to be $2,800,000, and will be paid from the proposed additional funding.

6) Increased pavement life for Section #1

In September 1984 it came to the attention of the GOCD that the design life of the section #1 road did not meet the twenty year standard envisioned in the Project Paper, but rather five years; although as designed the road would serve satisfactorily well beyond five years with additional overlays at six year intervals.

In order to satisfy the GOCD, LBII was asked to provide a twenty-year pavement design for section #1. The consultant indicated that the twenty-year design would require 6" of granular base or 3" of asphalt treated base in addition to the asphaltic concrete surface course included in the original design. The additional costs have been estimated at $1,600,000, and will be financed from the additional funding.

7) Landslides due to heavy rainfall

On November 1, 1984, eight days of heavy rain began which caused massive landslides throughout the entire island, making roads impassable and isolating villages. The GOCD appealed for emergency assistance from the international donors. It is evident that road section #3 (Pont Casse to Hatton Garden) cannot be reconstructed without additional cost for earthmoving, reconstructing embankments, and possibly bridging some eroded areas. Change orders for these activities will require appoximately $500,000 from the contingency.

III. PROJECT AMENDMENT DESCRIPTION

A. Goal and Purpose, Inputs and Outputs

The goal and purpose of the amended Project remain unchanged. The goal of the Project is to increase the per capita income and economic productivity in Dominica. The sub-goal is to establish and maintain a viable primary and secondary road transportation network. The purpose is to provide dependable access from Dominica's capital and major port to the agricultural areas of cental and eastern Dominica and the International Airport.

The Project outputs, Project inputs, and Project activities remain the same as in the original Project. This amendment does not propose any change in the description of roads to be rehabilitated or other activities than those presented in the original Project Paper and itemized in Section II.B. above. Specific changes in the pavement design for section #1 are described below.

B. Project Amendment Rationale

The present budget is inadequate to construct the road to the standards described in the original Project Paper or to the minimum standards desired and expected by the GOCD. Faced with the alternatives of 1) reducing the standard of road construction and/or deleting a section of road in order to stay within the $9.6 million level of funding, or 2) increasing the Life of Project funding by $5.3 million to maintain the standards and scope, the Mission has chosen the latter as the most beneficial to U.S. and GOCD interests.

An extension of the PACD is required because the active aspect of Hurricane Klaus in November 1984 and the subsequent water-laden slopes presents a constant threat of earth slide and road deterioration, and increases the time required for construction. Furthermore, sections #2 and #3 have not been maintained for the normal traffic but rather have been allowed to deteriorate beyond the time alloted in the contracts. The combination of these setbacks requires that the PACD be extended by nine months from September 30, 1985 to June 30, 1986.

C. Technical Considerations

The Project Paper, based on the Curran/Lebron feasibility study, proposed the construction of a 12 ft. to 18 ft. pavement with 1.5 ft. to 3 ft. shoulders on the existing alignment. The pavement structure was to consist of 4" to 6" of tarish base and a 2" asphaltic concrete hot mix (ACHMSC) course. The existing pavement was to be scarified, reshaped with additional base, and compacted prior to placement of the surface course.

The Project Agreement describes a similar project, including scarification of the existing pavement and placement of base and asphaltic concrete surface courses. The design and supervision contract was then awarded to LBII for the preparation of plans, technical specifications, cost estimates, and other bid documents for the project.

The terms of reference for the consultant specified general design criteria, including minimum pavement and shoulder widths, and maximum thickness of ACHMSC. Thickness of base was to be determined based on California Bearing Ratio (CBR) analyses conducted during design. LBII's preliminary report concluded that the budget allocated for construction, approximately $7,500,000, was not adequate for the pavement design originally envisioned, and recommended a 1 and 1/2" to 2" overlay only. Base course was proposed for widening and those sections which had deteriorated to the point where scarification could not be avoided. Even so, the estimated cost of the rehabilitation works proposed was $10,650,000.

Subsequently, at the request of AID and the GOCD, certain improvements proposed were deleted to reduce the estimated cost to $7,000,000. These deletions included a reduction in base course from 16,000 to 4,000 C.Y. Bids submitted for the construction work ranged from $7,600,000 to $11,500,000. The construction contract was ultimately awarded to NLTC, the low responsive bidder. After the construction contractor mobilized, it was discovered that some quantities shown in the bid schedule were erroneous and that additional works would have to be undertaken because of a further deterioration of the road, including both pavement and drainage.

In addition, the prefabricated bridge to be supplied by the GOCD for the Canefield Bridge proved to be unusable. The I beams supplied from excess property for the Hillsborough Bridge were 33" sections instead of the 36" sections required. As a result, the consultant had to redesign both structures, and the construction contractor was required to carry out additional steel fabrication on site.

The GOCD requested that AID provide additional funds to strengthen the pavement structure on Section #1 by adding the additional base course which would be required to provide a twenty-year pavement design. The GOCD indicated that the existing pavement structure was deteriorating rapidly under axial loads resulting from heavy construction traffic and that maintenance costs for the completed roadway would not be manageable.

Based on the pavement evaluation study conducted during the design phase, the consultant advised the that twenty-year pavement would require 14 cm (5" to 6") of crushed stone base in addition to the 2" ACHMSC provided under the original design. The additional strength could also be attained through the addition of 3" of high quality asphalt treated base course. Since the pavement structure proposed is similar to that envisioned in the Project Paper and the Project Agreement, and considering that only limited funds are available for recurrent maintenance, it is deemed in the best interest of the Project to adopt the new pavement design.

- Revised Pavement Design for Section #1

  The LBII design is based on the Transportation Research Boards (TRB) publication entitled Structural Design of Low Volume Roads (1983). For the twenty year design period, a traffic growth of 5% per annum was assumed based on substantially improved pavement conditions. The traffic mix (percentage of trucks) and

load distribution (number of equivalent 18 Kip (Kip = 1,000 lbs) axial loads per truck) were assumed to progress from low to medium, and light to medium, respectively.

Based on these assumptions, the number of repetitions of an equivalent 18 Kip axial load over the design life of the pavement was calculated to be approximately 900,000, compared to 45,000 for the five year design period initially used. For the increased number of equivalent axle loads (EALs), the TRB pavement design chart indicates a requirement for 14 cm (5" to 6") of granular base in addition to the 2" of asphaltic concrete surface course specified in the original design.

As an alternative, the granular base could be replaced by 2 and 1/2" to 3" of high quality ATB using a substitution ratio of 1" of ATB to 2" of granular base.

Since the use of ATB will preclude the need to scarify the existing pavement, result in considerable cost savings when compared to an equivalent thickness in granular base, and will hasten completion of the project because of reduced crushing requirements, the ATB was selected instead of straight granular base.

Major Quantity Overruns

Table II below indicates those work items for which there will be major overruns, the overrun amount, and the cause of the overrun. A more detailed analysis of anticipated cost increases in contained in Appendix I"

Table II - Major Quantity Overruns

Item	Bid	Revised Quantity	Overrun	Unit Price	Additional Cost	Cause
Cleaning & gumbling	15 acres	44 acres	29 acres	$1.800.00	$52.200	Underestimated, required to attain design widths
Hillside Excavation	2500 C.Y.	12,500 C..Y.	10,000 C.Y.	$ 13.00	$130,000	" "
Unpaved Ditch	39,500 L.F.	54,966 L.F.	15,466 C.F.	$ 3.00	[1] 46,396	Deterioration subsequent to design
Clean & Reshape Existing Ditches	25,700 L.F.	52,359, L.F.	26,659 L.C.	$ 2.30	$ 61,315	" "
Base Course	4,800 C.Y.	11,179 C.Y.	6,379 C.Y.	$ 100.00	$ 637,900	" "
Bituminous Concrete	22,600 Tons	31,500 Tons	8,900 Tons	$ 100.00	$ 890,000	" "
Asphalt Treated Base	-	16,835 Tons	16,835 Tons	$ 85.00	$1,430,975	Required to strengthen section I pavement
Scarification	3,800 S.Y.	22,522 S.Y	18,722 S.Y.	4.80	$ 89,865	Deterioration subsequent to design
24" R.C.P.	4,000 L.F.	4,673 L.F.	673 L.F.	98.75	$ 134,527[2]	Failure of existing culverts
36" R.C.P.	1,200 L.F.	1,451 L.F.	251 L.F.	$ 123.00	$ 48,797[2]	" "
Concrete Pipe Surround	-	333 C.Y.	333 C.Y.	$300.00	$100,000	Required to strengthen nonreinforced pipe culvert
Concrete Swale Drain Type I	200 L.F.	3,388 L.F.	3,188 L.F.	$ 24.00	$ 76,512	Deterioration subsequent to design
Concrete Swale Drain Type II	-	3,156 L.F.	3,156 L.F.	$ 30.00	$ 94,680	" "
Gabions	1850 C.Y.	3,400 C.Y.	1,550 C.Y.	$ 80.00	$124,000	Deterioration subsequent to design

[1] Assumed Negotiated Unit Price

[2] Net cost increase. Reinforced pipe substituted for non reinforced pipe

Maintenance

The construction contract with Nello Teer includes a one-year maintenance period. Maintenance activities will, however, be limited to those items which can be attributed to construction deficiencies and will not encompass routine maintenance such as clearing right-of-way and clearing drainage ditches and culverts. Upon the Owner's (i.e. the GOCD's) acceptance of specific segments of road, routine maintenance will become the responsibility of the GOCD's Ministry of Communications and Works.

While the construction contractor's responsibilities were discussed and clarified in the prebid conference, the contract documents do not provide a precise description of these responsibilities. When the construction contract is amended to cover the additional work required, the section dealing with the one-year maintenance period will be revised to reflect this understanding.

D. Economic Analysis

To determine the impact of the proposed changes, a new economic analysis was carried out for each of the three sections comprising the overall project. Average daily traffic figures for section #1 were adjusted to reflect more recent data generated by TAMS/Ray Jorgensen Associated, under the IDA-financed road maintenance project. This data, collected in March 1984, indicates that current traffic over section #1, excluding construction vehicles, is about 1970 vehicles per day, an increase of some 16% over the 1700 vehicles per day projected for 1984 in the Project Paper.

Traffic counts for sections #2 and #3 reflect the fact that much of the traffic has been diverted to the coastal roads due to the very deteriorated condition of these seqments and to the present limited use of the Melville Hall Airport by the regional airline LIAT. Consequently, these figures are not useful for projecting usage once sections #2 and #3 are repaired. Traffic projections developed from the Curran/Lebron study were therefore used for sections #2 and #3.

As in the Project Paper, benefits were attributed to user cost savings, both vehicle operating costs and time savings, and production gains resulting from the reduction in losses of bananas due to bruising in transit to the port in Roseau.

Revised costs for each section, including engineering design and construction supervision, are based on new estimates provided by LBII. The construction cost estimate was prepared using current unit bid prices. These prices can likely be reduced through renegotiation based on the increased quantitites of work involved. Construction costs as used in the analysis are thus deemed liberal.

As in the original analysis, labor costs are estimated at 15-18% of the total construction costs, and the assumption is made that 50% of the labor would come from the ranks of the under or unemployed. Thus financial costs attributed to labor have been assigned a shadow price of 0.50 to derive economic costs. Since the proposed pavement design is essentially the same as that envisioned in the Project Paper, annual maintenance costs are assumed to be the same as those used in the earlier analysis. As noted in Table III below, rates of return for the three road sections range from 10.5% to 23.2%.

Table III

Cost Benefit Analysis
(Costs & Benefits in 1984 EC Dollars)
Net Cash Flow (EC$000)

Year	Section 1 Roseau-Layou	Section 2 Layou-Pont Casse	Section 3 Pont Casse-Hatton Garden
1	-8133	-3588	-4641
2	-8133	-3588	-4641
3	1834	1694	2092
4	1916	1810	2174
5	1933	1842	2199
6	1995	1894	2257
7	2058	1948	2319
8	2124	2002	2382
9	1580	1494	1383
10	2280	2134	2547
11	2352	2195	2617
12	2406	2238	2712
13	2482	2302	2726
14	2560	2367	2801
15	2641	2435	2878
16	2112	1940	1894
17	2829	2593	3073
18	2917	2667	3128
19	2988	2725	3212
20	3081	2803	3301
IRR	10.5%	23.2%	21.4%

E. Waivers

Sole source waivers will be required to increase the value of the present host country engineering and construction contracts. It would not be practical to have either the additional supervision or construction work performed by other than the present contractors, and it is the GOCD's intention to have the present contractors complete the work. Thus the sole source waivers are justified in accordance with HB 11, Chapter 1, 2.4.2.a and Chapter 2, 2.3.3.a.

F. Revised Financial Plan

The revised estimated total cost of the project is $14,900,000. The original, current and proposed financial plans are compared in Table IV.

Table IV

	Item	Revised Financial Plan PP	Current	Add	Proposed
1.	LBII Engineering	469,000	1,138,000	257,000	1,395,000
2.	NLTC Bridge Construction	1,027,000	1,607,000	400,000	2,007,000
3.	NLTC Road Rehabilitation	6,464,000	6,475,660	4,400,000	10,875,660
4.	Contingency	1,640,000	379,340*	243,000	622,340**
	TOTAL	9,600,000	9,600,000	5,300,000	14,900,000

* This figure includes $257,000 for an additional LBII contract amendment, which is shown in the "add" column. A portion of this contract amendment reimburses LBII for work done regarding existing project activities. After this amount is committed, the true contingency is reduced to $122,340.

** Up to $500,000 of this amount will be required to pay for change orders to clear damage to the roads due to heavy rains.

As noted earlier, the revised estimated cost is based on current unit prices, many of which are expected to be reduced as a result of renegotiations. Since quantity increases are substantial, savings to be realized as a result of lower unit prices may approach $600,000. This amount would be added to the budgeted contingency, to provide a total contingency of some $1,222,000, or approximately 8% of total estimated project costs.

Appendix II contains a detailed cost estimate by section based on revised estimated quantities of work and unit bid prices.

G. Revised Implementation Plan

The construction contract was awarded to NLTC on August 10, 1983 and a Direct Letter of Commitment was issued to the contractor on October 25, 1983. Time allowed for the prosecution of work was 630 days, to begin sixty days after receipt of the Letter of Commitment. The present scheduled completion date is thus September 12, 1985. The additional work proposed under this amendment will require an extension to the contract time as well as an extension to the PACD which is presently September 30, 1985. This amendment proposes to extend the PACD to June 30, 1986.

Table V

Revised Implementation Plan

Activity	Date
Amendment authorized	01/01/85
Project Agreement Amendment signed	01/15/85
Construction Contract Amendment Executed	01/30/85
Engineering Contract Amendment Executed	02/15/85
Begin Paving Operation	03/01/85
Complete and Open Canefield Bridge	04/15/85
Complete installation of pipe culvert Tarou Box Culvert, and Hillsborough Bridge I	05/01/85
Complete and Turn Over Section #1 to GOCD	06/30/85
Complete Ditch Paving	08/01/85
Complete and Turn Over Section #2 to GOCD	09/30/85
Complete Hillsborough Bridge II	11/01/85
Complete Paving Operation	12/31/85
Complete and Turn Over Section #3 to GOCD	01/15/86
Complete Demobilization and Clean Up	03/15/86
PACD	06/30/86

The revised detailed construction schedule by line item is shown in Appendix II.

Drafted by:CPO:JNConnolly:maw

Clearances:

A/RLA:RBMeighan (in draft)
C/DR:PROrr (in draft)
CONT:RLWarin (in draft)
C/ENG:MDeMetre (in draft)
PRM:BJensen (in draft)

APPENDIX I

JUSTIFICATION OF COST INCREASES

Clear and Grub (Item 201)

Original billed quantity	.....	15 acres
Revised estimated quantity	.....	44 acres
Additional quantity	.....	29 acres
Additional cost	.....	US$ 52,200

The estimated increase in this item can be attributed to the following:-

(i) Additional widening and hillside cut. In the original design very little widening in hillside cut was anticipated for reasons detailed hereinafter. With the increase in hillside cut, and consequently widening, the area to be cleared and grubbed has increased.

(ii) In order to reduce the amount of drainage works - ditch excavation and ditch cleaning and reshaping - existing ditches are to be utilised wherever possible. Many existing ditches are in fair shape apart from being full of heavy vegetation. In order to improve flow in these ditches, the vegetation will be cleared.

Unclassified Hillside Excavation (Item 203(1))

Original billed quantity	.....	2,500 yd^3
Revised estimated quantity	.....	12,500 yd^3
Additional quantity	.....	10,000 yd^3
Additional cost	.....	US$ 130,000

The increase in this quantity is due to the extra hillside excavation required to attain the specified road widths. The designed road widths were as follows:-

Section 1 - Up to 18ft. + 1.5 ft shoulder (each side)
Section 2 - Up to 16 ft. + 1.5 ft. shoulder (each side)
Section 3 - Up to 12 ft. + 3 ft. shoulder (each side)

In this design it was envisaged that wherever large hillside cut quantities would be involved in obtaining these widths the road width be reduced to save hillside cuts. (See page 3, Section II. A. 2 of Phase 1 report). This philosophy was followed as far as practicable, however, there were a number of areas, notably in Section 1, where the existing width was so narrow as to be hazardous and for safety reasons, it was determined to widen these sectionseven though appreciable hillside cut was involved. These locations were as follows:- (i) Canefield Cliffs; (ii) adjacent to the Dominica Coconut Products Factory at Belfast; (iii) Tarou Village (South); (iv) beside Layou River, station 526+00 to station 538+00. These four locations account for 5,560 yd^3 of hillside cut. At Canefield Cliffs, the hillside cut was needed as progressive erosion of the seaward side of the road had prevented widening on that side.

During the recent rainy season, it became apparent that the hillside from station 325+00 to station 345+00 is highly unstable and many landslides occurred. In order to stabilise this hillside,and thus protect the road, further hillside cutting is proposed in this area - approximately 3,000 yd^3.

Unpaved Ditch (Item 203(2))

Original billed quantity	.....	39,500 L.F.
Revised estimated quantity	.....	54,966 L.F.
Additional quantity	.....	15,466 L.F.
Additional cost	.....	US$ 46,396.50

The estimated increase in this item can be attributed to the following:-

(i) The quantity increase in this item is due to progressive silting-up and blocking of existing ditches. This condition has been exacerbated by the fact that little up station maintenance has been undertaken, primarily due to the fact that the conditions require reconstruction and not maintenance.

(ii) The attempt to maintain minimum width requires that, even where ditches are adequate, due to widening, they must be filled in and new ditches cut outside of the existing ditch line.

It is felt that good drainage is a necessity on this Project, and any investment in drain construction is money well spent to protect the greater investment in the new pavement.

Clean and Reshape Existing Ditch (Item 203(4))

Original billed quantity	.....	25,700 L.F.
Revised estimated quantity	.....	52,359 L.F.
Additional quantity	.....	26,659 L.F.
Additional cost	.....	US$ 61,315

As with unpaved ditch many existing ditches which at the time of the original design were in good condition have now silted up and require cleaning and reshaping.

5) Borrow Excavation (Item 203(3))

Original billed quantity	.....	25,000 yd^3
Revised estimated quantity	.....	14,520 yd^3
Reduction in quantity	.....	10,480 yd^3
Cost Saving	.....	US$ 110,040

There is a considerable saving anticipated on this item due primarily to the change from a bridge to a box culvert at Tarou, saving a large amount of fill required for the bridge approach embankment.

6 Base Course (Item 304)

Original billed quantity	.....	4,800 yd^3
Revised estimated quantity	.....	11,179 yd^3
Additional quantity	.....	6,379 yd^3
Additional Cost	.....	US$ 637,900 ,

In explaining the reasons for the increased quantities of this item, the item is broken down into (i) Patching; (ii) Widening and Shoulder; (iii) New Base Course (reconstructed areas). Quantities broken down in this way for original bills are not available to the Engineers site staff and in the detailed costing, the breakdown in the original bill is estimated.

(i) Patching:-

It is estimated that an additional 1,770 yd^3 of base course material will be required for patching work. This additional requirement is due to the further rapid deterioration of the road surface since the original design. This deterioration is so rapid that since the completion of the patching in Section 1 and the onset of the rainy season, a considerable number of additional

potholes have appeared. Deterioration of the road in the past year has been accelerated by considerably heavier traffic loadings than the road has experienced due to construction traffic - Nello Teer, Rush and Tomkins and the Ministry of Communications and Works have hauled material along the road for their respective projects. In terms of axle loadings, this traffic has been vastly higher than at any other time in the road's history. Further deterioration and additional patching is expected until such time that the overlay asphaltic concrete is laid. Deterioration has been exacerbated by poor drainage. It must be stressed that the estimate of this quantity is not accurate and is based solely on a visual inspection of the road. Indeed, this quantity could be significantly higher and depends largely on when the Contractor lays his surfacing.

(ii) Widening and Shoulders:-

It is estimated that an additional 2,716 yd^3 of base stone is required for carraigeway widening and shoulders.

This additional quantity is necessary for two reasons:-

(a) With the decision to attempt to meet the originally specified road widths, rather than making the road fit the existing available width, an additional quantity of widening is involved. This quantity has been minimised by (i) reducing the width of shoulder to receive base stone from 1.5 ft. to 1.0 ft. and (ii) the Contractor agreeing to construct a minimum widening width of 2.5 ft, as opposed to the 3.0 ft. shown in the original contract drawings. The decision to put base course in only 1 ft. of shoulder necessitates sealing the shoulder with prime coat to protect the base course from the ingress of water

This prime seal had been omitted from the original design to save cost but it is felt essential now that the base course cannot freely drain into the side ditches. The saving involved in this redesigned shoulder (including the additional cost of prime coat) is as follows:-

Saving in base course material	.....	$ 97,222.00
Additional cost of prime coat	.....	$ 25,900.00
	US	$ 71,322.00

(b) The erosion of the existing road edges during the past year, due to reasons detailed earlier, has reduced the width of the existing road necessitating extra widening to attain the required carraigeway widths.

(iii) New Base Course

New base course is required for sections which are to be scarified and reconstructed, and in those sections to be raised for drainage purposes.

In the original design a total of 16,200 yd^3 of new base course was proposed. By the time of tender and merely to reduce costs, the total amount of base course had been reduced to 4,800 yd^3, of which 500 yd^3 was new base course, required in Section 3 only. Since construction commenced much further deterioration of the road has occurred in all three sections, and it is deemed necessary to scarify certain additional areas and add new base course to provide the necessary strength - this is in addition to the A.T.B. requirement explained in section 7 of this report. The total additional new base course required is 1,900 yd^3, of which 550 yd^3 is required in two locations where the road embankment is to be raised to keep clear of flood waters in the Layou River Valley.

Asphalt Concrete (Item 401(1)

(i) Wearing and Levelling Course

Original billed quantity	.....	22,600 tons
Revised estimated quantity	.....	31,500 tons
Additional quantity	.....	8,900 tons
Additional cost	.....	US$ 890,000

In the original design for this road, the amount of asphalt required for an adequate design was estimated at 31,500 tons (see Phase 1 report supplement page 22 - April 1983). For purposes of reducing cost only, this quantity was reduced to 22,600 tons in the tender quantity. This quantity provided an absolute minimum asphalt concrete overlay to the existing road, merely to make the road passable, rather than to give a lasting pavement. In order to extend the useful life of the road, it is now strongly felt that the original designed quantity must be provided.

(ii) Asphalt Treated Base (A.T.B.)

Original billed quantity	.....	0 tons
Estimated quantity	.....	16,835 tons
Additional quantity	.....	16,835 tons
Additional cost	.....	US $ 1,430,975

Since construction commenced there has been a significant increase in the rate of deterioration of the road and the provision of a new sound base course, particularly for the most heavily trafficked section 1 from Roseau to Hillsborough, is a necessity. It is strongly recommended that a 3" thick asphalt treated base (A.T.B.) course be provided in section 1. It should be noted that in the original design a new base course requirement of 16,200 yd^3 was estimated (see Phase 1 report supplement, page 24 - April 1983). In order to minimise costs, this new

base course quantity was reduced to 500 yd^3 in the final design. The quantity of new base course requirement now, other than asphalt treated base, is 2,400 yd^3.

Providing this 3" A.T.B. to Section 1 would cost US$ 1,430,975 compared with the cost of US$ 1,380,000 for the 13,800 yd^3 of new crushed stone base course still left out from the original design requirement. The Consultants and Government of Dominica consider this 3" A.T.B. course absolutely necessary if a lasting road is to be built. An asphalt treated base is preferred to a crushed stone base for the following reasons:-

(i) 3" A.T.B. is equivalent to not less than 6" of crushed stone base course in terms of strength - and is moreover more durable in a high rainfall area.

(ii) Using A.T.B. precludes the need to scarify existing road before laying base course.

(iii) A 3" A.T.B. course provides a low profile road, able to merge into existing side drains and other constraints without necessitating major grade modifications.

(iv) Laying a 3" A.T.B. course will be considerably faster than laying a minimum 6" crushed stone base - particularly in terms of stone crushing time. This is especially critical here in Dominica, where the Contractor is experiencing difficulties in obtaining his crushed stone requirements.

(v) Cost wise 3" A.T.B. is likely to be equivalent to 4.5" to 5" thickness of crushed stone base course.

Scarify (Item 401(2))

Original billed quantity	.....	3,800 yd^2
Revised estimated quantity	.....	22,522 yd^2
Additional quantity	.....	18,722 yd^2
Additional cost	.....	US$ 89,866

The justification for this item increase is the same as for new base course outlined in Section 6(iii) of the report.

9) Prime Coat (Item 410(1))

Original billed quantity	.....	13,000 gals
Revised estimated quantity	.....	42,427 gals
Additional quantity	.....	29,427 gals
Additional cost	.....	US$ 108,880

With the large increase in base course requirements due to extra widening, patching and reconstruction there is a correspondingly large increase in the prime coat requirements.

10) Tack Coat (Item 410(2))

Original billed quantity	.....	38,000 gals
Revised billed quantity	.....	21,975 gals
Reduction in quantity	.....	16,025 gals
Cost saving	.....	US$ 65,703

Due to the deterioration of the existing pavement, widening, patching and reconstruction quantities have increased dramatically and these areas will be primed and should not require a tack coat. Consequently, the amount of tack coat has been reduced considerably, thus offsetting the increased cost in prime to some extent.

11) Culvert Headwalls (Item 602(1))

Original billed quantity	.....	120 yd^3
Revised estimated quantity	.....	269 yd^3
Additional quantity	.....	149 yd^3
Additional cost	.....	US$ 59,600

With the overall increase in pipe culvert quantities and concrete surround addition, there has been an increase in the headwall requirements. Also headwalls are now being ordered where no headwall was denoted on the original plans, as this is often cheaper than extending the pipe length. The original design was made with the object of cutting costs to a bare minimum.

12. Drop Structures (Item 602(2))

Original billed quantity	.....	20 yd^3
Revised estimated quantity	.....	55 yd^3
Additional quantity	.....	35 yd^3
Additional cost	.....	US$ 20,700

This item has increased due again to the increased number of culverts required and due to the originally designed drop inlet dimensions having to be enlarged in some locations.

13. R.C. Box Culverts (Item 602(3))

Original billed quantity	.....	30 yd^3
Revised estimated quantity	.....	75 yd^3
Additional quantity	.....	45 yd^3
Additional cost	.....	US$ 21,150

The only box culvert construction in the original design was for a twin 5' x 2' box at Hillsborough Estate, station 414+50. In addition to this structure, it has been necessary to construct a 4' x 2' box culvert at station 289+00 where an existing water main prevented use of the pipe culvert originally designed at this location. Further, some five small (2' x 1.5') box culverts have been placed across side accesses. These were not provided for in the original design in order to reduce costs, however, the Ministry of Communication and Works instructed that the Project provide culverts across access private and public as necessary. We fully agree with the Ministry that this provision is necessary.

14) 18" Ø Unreinforced Concrete Pipes (Item 603(A23))

Original billed quantity	.....	310 L.F.
Revised estimated quantity	.....	251 L.F.
Reduction in quantity	.....	59 L.F.
Cost savings		US$ 3,848

Reassessment of the drainage throughout the whole job in order to minimise costs results in a small saving in this item.

15) Introduction on 24"Ø, 36"Ø and 48"Ø Pipes

In an effort to minimise costs unreinforced concrete pipes were designed for the Project. However, after laying a few runs of pipe in the Roseau and Canefield areas, it was found that, small hairline cracks had appeared in some of the pipes. Consequently, it was determined to use reinforced concrete pipes in the remainder of the job and a price for these pipes was negotiated with the Contractor. Prior to discovering the cracks, the Contractor had already cast a large number of pipes and it was decided to use these, surrounded in a concrete envelope. Those pipes already inplace were protected by placing a concrete slab over the culvert to distribute the traffic loading.

24" Ø Unreinforced Concrete Pipes (Item 603(B23)) and 24"Ø Reinforced Concrete Pipes.

Original billed quantity (Unreinforced)	.....	4,000 L.F.
Revised estimated quantity (Unreinforced)	.....	1,632 L.F.
Reduction in quantity (Unreinforced)	.....	2,368 L.F.
Original billed quantity (Reinforced)	.....	0 L.F.
Revised estimated quantity (Reinforced)	.....	3,041 L.F.
Additional quantity	.....	3,041 L.F.
Net additional quantity (24"Ø)	.....	673 L.F.
Net additional cost	.....	US$ 134,527.

The additional quantity of 24"Ø pipe is due to the following:- (i) Additional length required for increased road width; (ii) failure of some existing culverts since the design phase requiring replacement with new 24"Ø pipes; (iii) extensions of existing pipes to provide the specified width in areas where no widening had been anticipated; (iv) additional pipes required after closer examination of drainage run-off during the supervision phase of the Project.

The increased cost is due (i) due to increased length and (ii) to the increased unit rate of $98.75, viz-a-viz $70.00 per linear foot for reinforced pipe compared with unreinforced pipes.

16) 36"Ø Unreinforced Concrete Pipes (Item 603(C23)) and 36"Ø Reinforced Concrete Pipes

Original billed quantity (Unreinforced)	.....	1,200 L.F.
Revised estimated quantity (Unreinforced)	.....	418 L.F.
Reduction in quantity (Unreinforced)	.....	782 L.F.
Original billed quantity (Reinforced)	.....	0 L.F.
Revised estimated quantity (Reinforced)	.....	1,033 L.F.
Additional quantity (Reinforced)	.....	1,033 L.F.
Net additional quantity	.....	251 L.F.
Net additional cost	.....	US$ 48,797.50

The justifications elaborated on for 24"Ø pipes apply also for 36"Ø pipes. In this case though the difference in unit rate between reinforced and unreinforced pipe is $123.00 viz-a-viz $100.00 per linear foot.

17) 48"Ø Unreinforced Concrete Pipes (Item 603(D23)) and 48"Ø Reinforced Concrete Pipes.

Original billed quantity (Unreinforced)	.....	250 L.F.
Revised estimated quantity (Unreinforced)	.....	114 L.F.
Reduction in quantity (Unreinforced)	.....	136 L.F.

Original billed quantity (Reinforced)	.....	0 L.F.
Revised estimated quantity (Reinforced)	.....	114 L.F.
Additional quantity (Reinforced)	.....	114 L.F.
Net reduction in quantity	.....	22 L.F.
Net additional cost	.....	US$ 3,163.60

The reduction in quantity for this item is due to a reassessment of the drainage which showed that some existing culverts were adequate and did not require replacement. For example, it was proposed in the final design to replace existing culverts at station 49+00 and station 179+00, however, after study on site and discussions with locals, it was decided that the existing culverts were adequate. There is however, a small net increase in cost for this item, due to the difference between the unit rates of unreinforced and reinforced pipes, $206.50 viz-a-viz $150 per linear foot.

18) Concrete Pipe Surround

Original billed quantity	.....	0 yd^3
Revised estimated quantity	.....	333 yd^3
Additional quantity	.....	333 yd^3
Additional cost		US$ 100,000

The reason for the use of a concrete pipe surround is detailed in the introduction to 24"Ø, 36"Ø and 48"Ø pipes. A rate of US$300.00 per yd^3 was negotiated with the Contractor for this work.

19 Reinforced Concrete Retaining Walls

Additional cost	.....	US$ 35,000

No retaining walls were necessary at the time of the original design. However, during the early stages of the Project, it

was noticed that an existing retaining wall at station 351+00 had begun to fail. The failure became more severe during the following months and it was deemed necessary to replace this wall, the complete failure of which would sever the route from Roseau to Hillsborough. A reinforced concrete structure will be used because of the lack of working space at this location.

20) Paved "U" Ditch (Item 622(1))

Original billed quantity	10,000 L.F.
Revised estimated quantity	10,302 L.F.
Additional quantity	302 L.F.
Additional cost	US$ 9,966.00

A reevaluation of drainage requirements showed that some paved "U" Ditch could be eliminated as vegetation cover would adequately protect an unpaved ditch. Further, 2,750 L.F. of unpaved ditch at Canefield Cliffs was replaced with concrete swale drain. However, after cutting new ditches between the Villages of Massacre and Mahaut, and in the Belfast area, that had been considered stable areas, it was found that the new ditches would need paving if erosion was to be curtailed. Consequently, the overall net change in this quantity is an increase of 302 linear feet.

Concrete Swale Drains

Concrete swale drains are split into Type I and Type II. The former is constructed at the Contractor's bid price of $24.00 per linear foot, whereas Type II is a change to the form of swale shown in the drawings and is constructed at a negotiated price of $30.00 per linear foot.

21) Concrete Swale Drain Type I (Item 622(2))

Original billed quantity	.....	200 L.F.
Revised estimated quantity	.....	3,388 L.F.
Additional quantity	.....	3,188 L.F.
Additional Cost	.....	US$ 76,512.00

The majority of the increase, 2,750 L.F., in this item is due to the replacement of paved 'U' ditch along the Canefield Cliffs with concrete swale drain. This was deemed desirable for safety and cost reasons as to put in a paved 'U' Ditch would have entailed large quantities of hillside cut or the location of the ditch unacceptably close to the carraigeway.

Further quantity increases are due to the use of this type of ditch in areas where construction of unpaved ditches would entail unacceptably large quantities of hillside excavation, such as station 221 to station 225 where a large amount of rock cut would be required.

2) Concrete Swale Drain Type II

Original billed quantity	.....	0 L.F.
Revised estimated quantity	.....	3,156 L.F.
Additional quantity	.....	3,156 L.F.
Additional cost	.....	US$94,680

This drain type is a modification of the swale
on the Contract Drawings and is paid for at
price of $30.00 per linear foot.

This drain is required in areas
would entail unacceptably lar
1,950 linear feet of new swal
to station 347+00, and area of

23) Gabions (Item 630)

Original billed quantity	.....	1,850 yd^3
Revised estimated quantity	.....	3,400 yd^3
Additional quantity	.....	400 yd^3
Additional cost	.....	US$ 124,000

A large amount of additional gabion protection has been placed at Canefield Cliffs and Jimet seashore in Section I. These gabion works are necessary for the following reasons: (i) At Canefield Cliffs, sea action and run-off from the existing road had seriously eroded the seaside bank of the road, reducing the width and causing gullies which in turn, lead to progressive erosion. Gabions have been placed here for two reasons:- to control erosion of the road; and to provide sufficient carraigeway width without having to resort to vast quantities of hillside excavation. (ii) At Jimet the original design called for widening on the landward side of the road, however, a new housing scheme on the hillside would have been threatened by any hillside excavation in this area. Consequently the widening in this area, was attained by placing gabions to the seaward side of the road and backfilling.

Further additional gabions are required as bank protection to the Layou River at station 481, where a recent flood (July 01) eroded 3 feet of the bank and now threatens the road itself, over a 200 feet length.

An area of road prone to annual flooding between station 504 to station 510, is to be raised using fill material. This new fill is to be protected from river erosion, using gabion baskets

24) Bridge Deck Replacement and Widening

Deck replacement and widening of certain narrow bridges is required at five small-span bridges in the Villages of Massacre and Mahaut. Currently, the deck widths allow only one-way traffic in an area of high traffic density, leading to congestion and a very high accident risk. In two cases, removal and replacement of the existing decks will be necessary, whilst at the other three locations, the existing structure can be widened. It is proposed to widen the bridges to a minimum 18 feet.

Preliminary cost estimates, inclusive of design costs and construction detours for all five bridges, indicate that US$ 155,000 is required for this work.

HELLO L TEER COMPANY

Original Completion September 13

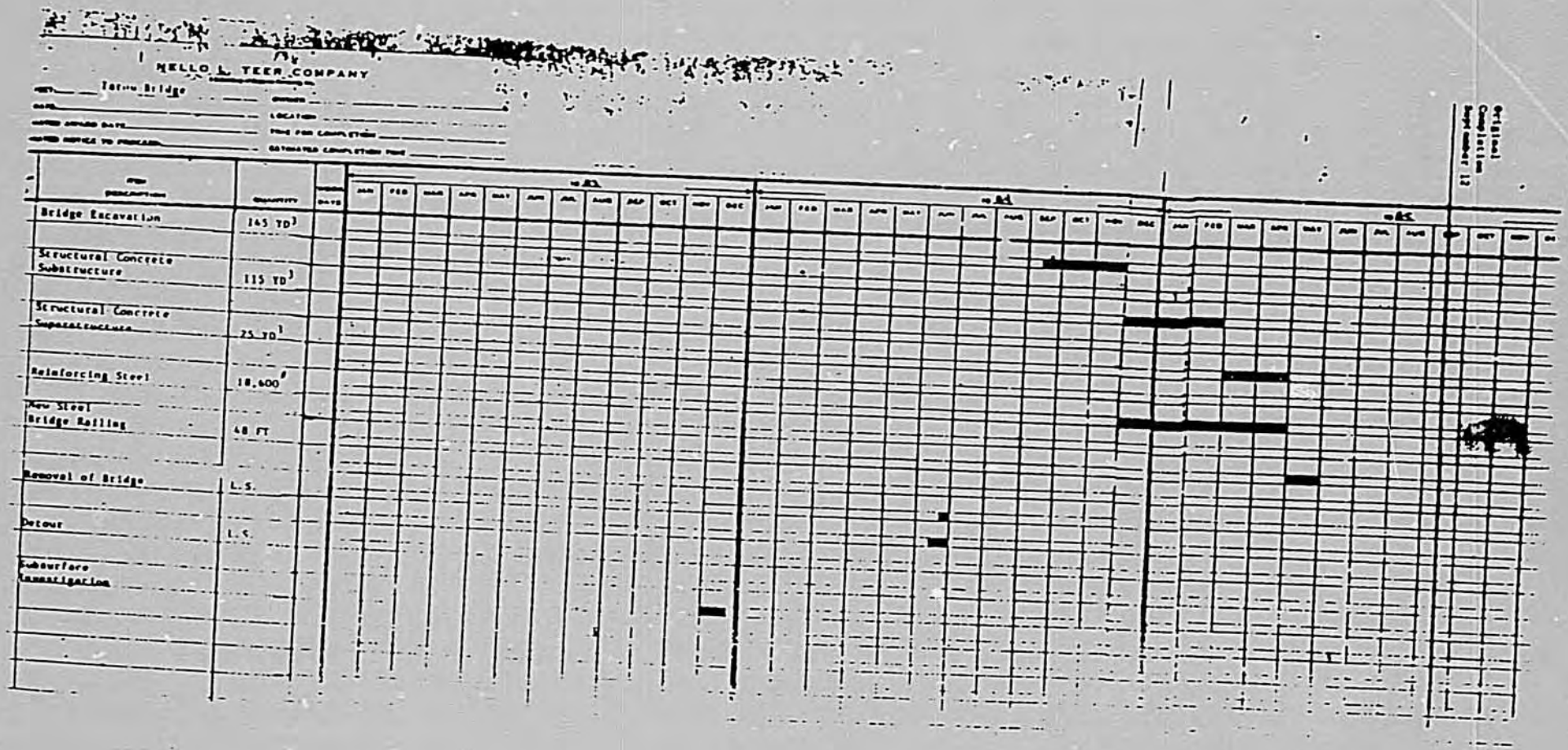
Revised Completion Date, April 15

Mobilization	L.S.	
Maintenance & Protection of Traffic	L.S.	
Project Construction Signs	6 EA.	
Clearing & Grubbing	ACRE	
Removal of Structures & Obstructions	L.S.	
Unclassified Excavation Offsite		
Unclassified Ditch Excavation	5,000 LFT	
Borrow Excavation for Embankment	11,000 YD³	
Backhoe & Clean Existing Ditches	LFT	
Landslide Excavation adjust Existing Fences & Covers	10,000 YD³ 53 EA.	
Crushed Aggregate Base Courses		
Concrete Pavement + ATB	30,400 YDS	
Scarify Existing Pavement	18,500 YDS	
Prime Coat (MC-70)	29,800 GAL	
Tack Coat (RC-70)	22,800 GAL	
Concrete or Rubble Masonry Headwalls	270 YD³	
Concrete or Rubble Masonry Bank Structures	YD³	
Reinforced Concrete Culverts with Headwalls	64 YD³	

Appendix II

MELLO L. TEER COMPANY

Tarrow Bridge



HELLO L. TEER COMPANY

Canefield Bridge — OWNER

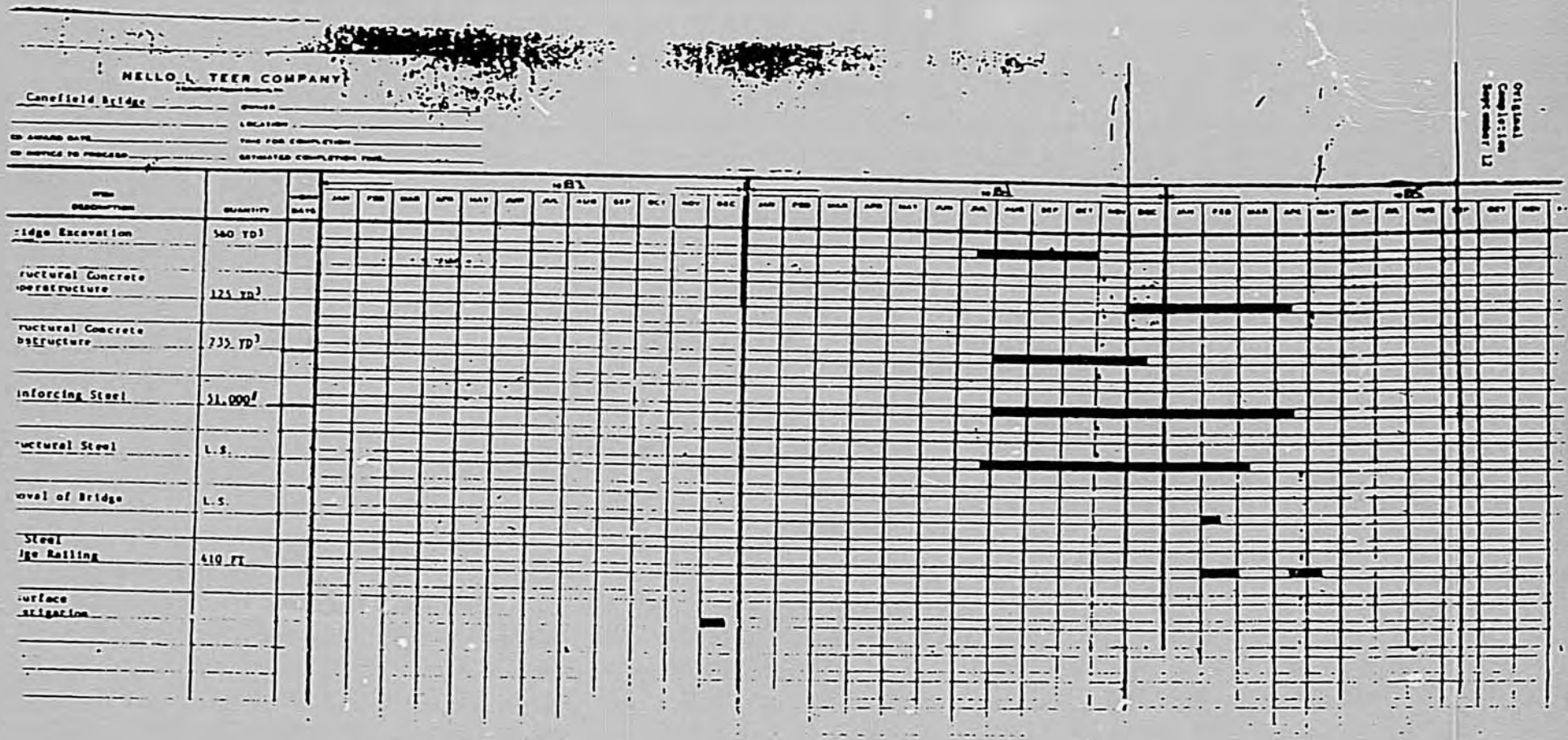
LOCATION

AWARD DATE — TIME FOR COMPLETION

NOTICE TO PROCEED — ESTIMATED COMPLETION DATE

Original Completion September 13

ITEM DESCRIPTION	QUANTITY	WORKING DAYS
Bridge Excavation	560 YD³	
Structural Concrete Superstructure	125 YD³	
Structural Concrete Substructure	735 YD³	
Reinforcing Steel	51,000#	
Structural Steel	L.S.	
Removal of Bridge	L.S.	
Steel Bridge Railing	410 FT	
Surface Irrigation		



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HELLO L TEER COMPANY

CT Hillsborough Bridge

ITEM DESCRIPTION	QUANTITY	WORK DAYS
Bridge Excavation	1500 YD^3	
Structural Concrete Superstructure	210 YD^3	
Structural Concrete Substructure	675 YD^3	
Structural Steel	L.S.	
Removal of Bridge	L.S.	
New Steel Bridge Railing	646 FT	
Subsurface Investigation		
Reinforcing Steel	175,400	

'83

Original Completion September 12

'84

HELLO L. TEER COMPANY

18" Dia. Concrete Pipes	230 FT.	
[illegible]" Dia. Concrete Pipes	4200 FT	
[illegible]" Dia. Concrete Pipes	1320 FT	
[illegible]" Dia. Concrete Pipes	208 ft	
[illegible]oming Existing [illegible]rainage Structures	40 EA.	
[illegible]ip-Rap Slope Protection	200 TD^3	
[illegible]aved "V" Ditch	5650 FT	
[illegible]aved Swale Ditch	6025 FT	
[illegible]abions	2250 TD^3	
[illegible]eplace Bridge [illegible]ailing Type I	590 FT	
[illegible]eplace Bridge [illegible]ailing Type II	160 FT	
[illegible]eplace Bridge [illegible]ailing Type III	80 FT	
[illegible]eplace Bridge [illegible]ailing Type IV	130 FT	
Plugging of Scour	L. S.	

Original Completion September 12