

PD-ABH-040
25000

SARP

REGIONAL TRANSPORT

DEVELOPMENT II

KAFUE-LUSAKA ROAD

REHABILITATION

(690-0254)

PP AMENDMENT I

AUGUST 10, 1993

APPENDIX 3A, Attachment 1
Chapter 3, Handbook 3 (TM 3:43)

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

L. TRANSACTION CODE

A = Add
 C = Change
 D = Delete

Amendment Number

1

DOCUMENT CODE

3

COUNTRY/ENTITY
SOUTHERN AFRICA REGIONAL

3. PROJECT NUMBER
690-0254

4. BUREAU/OFFICE
USAID/ZAMBIA

5. PROJECT TITLE (maximum 40 characters)
REGIONAL TRANSPORT DEVELOPMENT II
KAFUE-LUSAKA ROAD REHABILITATION

6. PROJECT ASSISTANCE COMPLETION DATE (PACD)

MM DD YY
11 23 94

7. ESTIMATED DATE OF OBLIGATION
(Under "B" below, enter 1, 2, 3, or 4)

A. Initial FY 90 B. Quarter 4 C. Final FY 93

8. COSTS (\$3000 OR EQUIVALENT \$1 =)

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total	12,000		12,000	25,586	3,254	28,840
(Grant)	(12,000)	()	(12,000)	(25,586)	(3,254)	(28,840)
(Loan)	()	()	()	()	()	()
Other U.S.						
Host Country					3,144	3,144
Other Donor(s)						
TOTALS	12,000		12,000	25,586	6,398	31,984

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) DFA	800	821		23,340		5,500		28,840	
(2)								28,840	
(3)									
(4)									
TOTALS				23,340		5,500		28,840	

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

220

11. SECONDARY PURPOSE CODE

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

A. Code

B. Amount

13. PROJECT PURPOSE (maximum 480 characters)

To improve the efficiency of inter-regional transport system by reducing operating costs and by extending the life of the Kafue-Lusaka Road.

14. SCHEDULED EVALUATIONS

Interim MM YY Final MM YY
11 93 12 94

15. SOURCE/ORIGIN OF GOODS AND SERVICES

000 941 Local Other (Specify) 935

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of 3 page PP Amendment)

The Kafue-Lusaka Road Project was originally obligated with a Grant of \$22,840,000 in 1990, followed by another \$500,000 in 1992. This is a Project Paper Amendment for an expanded effort incorporating the prior obligations of \$23,340,000. The original Project Paper was approved on July 26, 1990. USAID/Zambia did not prepare a Project Paper amendment for the 1992 obligation.

17. APPROVED BY

Signature

Fred E. Smith

Title

DIRECTOR, USAID/ZAMBIA

Date Signed

MM DD YY
10/10/93

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM DD YY
10/27/93

ACTION MEMORANDUM FOR THE DIRECTOR, USAID/ZAMBIA

FROM: Dave Straley, PDO 
SUBJECT: Project Paper Supplement: Regional Transport Development II;
Kafue-Lusaka Road Rehabilitation (690-0255)
DATE: August 10, 1993

Action:

Your approval is requested to i) approve the subject Project Paper Supplement, ii) amend the Project Authorization and iii) amend the Project Grant Agreement to increase grant funding by \$5,500,000 pursuant to Section 496 of the Foreign Assistance Act of 1961, as amended, for a new life of project total of \$28,840,000. The Project Assistance Completion Date of December 12, 1994, will remain the same.

Background and Description:

The purpose of the Project is to improve the efficiency of the inter-regional transport system by reducing operating costs and by extending the life of the Kafue-Lusaka (KL) Road. The KL Road is an important part of the SARP strategy. Several major road systems serve intra-regional and overseas trade in the Southern Africa region. Although built to satisfactory standards, many of the regional truck roads which serve international trade require rehabilitation. This is the result of less than adequate maintenance, excessive vehicle loads, civil disturbances and general neglect associated with a historical lack of emphasis on regional development.

The proposed \$5,500,000 increase in funding will be used to widen a portion of the original project and to extend the rehabilitation of the road to Kafue circle in Lusaka pursuant to the Third Amendment to the Project Grant Agreement. Specifically the increase in project funding includes \$1,100,000 for widening the Chilanga-Makeni portion of the road (11.1 km.) from two lanes to four lanes, \$3,300,000 for the rehabilitation of the four lane Makeni-Lusaka portion (3.625 km.), an additional \$730,000 for supervision of construction, and \$370,000 for inflation and contingencies. The rehabilitation of the last 3.625 km. portion of road from Makeni into Lusaka was envisioned under the original project design, but was dropped because of insufficient Project funding available at the time.

The Government of Zambia (GRZ) counterpart organization is the Roads Department. Through a host country contract, the Roads Department has contracted with Kajima Corporation to rehabilitate the road. Financially, the GRZ is contributing Zambian Kwacha 40 million (equivalent to approximately US\$80,000) for the conceptual and final design of the Makeni-Lusaka portion of the Kafue-Lusaka road, even though FAA Section 110 requiring a 25 percent host country contribution is not applicable to this regional project. Given the appalling state of the nation's roads, the GRZ is adopting reforms which will generate revenues for road maintenance. The reforms include an explicit road tariff consisting of an international transit traffic fee, vehicle license fees, and a specific surcharge added to the price of fuel. The GRZ is also considering ways to improve Roads Department organization and management, operational efficiency of the road sector, and staff incentives and training.

Analyses and other requirements:

The Project Paper Supplement demonstrates that:

The Project is technically economically and socially sound, and administratively feasible;

The technical design and cost estimates have been prepared by an engineering consulting firm and are reasonable and adequately planned, thereby satisfying the requirements of Section 611 (a) of the Foreign Assistance Act, as amended;

The timing and funding of Project activities are appropriately scheduled and the implementation plan is realistic and establishes a reasonable time frame for carrying out the Project;

Adequate provision has been made for evaluation and audit.

A 611 (e) certification has been made that the Government of Zambia can effectively maintain and utilize the assistance provided by the Project.

An Initial Environmental Examination for work in this amendment was approved by the Africa Bureau Environmental Officer with GC concurrence on April 5, 1993.

Conditions and Covenants:

To ensure sound project implementation and maintenance after the road rehabilitation is completed, the Third Amendment to the Project Grant Agreement requires the GRZ/Grantee to satisfy the following conditions precedent prior to the disbursement of funds for the Lusaka-Makeni section of the road:

Conditions Precedent:

The GRZ will provide A.I.D. with an updated road maintenance plan, in form and substance satisfactory to A.I.D., describing the steps it plans to take to ensure proper maintenance of the road from Chirundu to Lusaka, after project rehabilitation is completed, as well as the schedule of resources to be made available for this purpose;

The GRZ will start resealing, repair shoulders, clear ditches, put up road signs, within the 1993 dry season, in at least 40 kilometers of the Kafue-Chirundu road as originally planned by the Roads Department;

The GRZ will re-initiate operation of weighbridge at Kafue; and

The GRZ will provide A.I.D. a letter of commitment, in form and substance satisfactory to A.I.D. providing assurances that all land required to complete the proposed road rehabilitation as amended between Lusaka and Chilanga has been acquired.

In addition, the Third Amendment to the Project Grant Agreement requires the GRZ to comply with the following covenants:

(a) to carry out appropriate maintenance of the T2 road from Chirundu to Lusaka and make provisions for the necessary staffing, training, equipment and funding to achieve this purpose;

(b) that it will provide additional funds, above those amounts otherwise required by conditions precedent, to the extent necessary to ensure adequate maintenance of the T2 road from Chirundu to Lusaka;

(c) to increase private sector involvement in road maintenance to supplement the activities of the Roads Department and proceed to create a more favorable business environment for consultants and contractors with the intention of building the country's road maintenance capacity;

(d) to amend the existing legislation (Statutory Instrument No. 84 of 1990) to raise the maximum laden weight from 24,000 kilograms to 48,000 kilograms in line with the neighboring countries as recommended in weighbridge study prepared by Petit & Partners for the Roads Department;

(e) to undertake a study, to be separately funded by A.I.D., to review options relating to toll collection, tariffs, weighbridge operations, and funds management for the purpose of controlling vehicle loading and providing funds to maintain the Chirundu - Lusaka road. Options will include, but not be limited to, amalgamation of toll and weighbridge functions and implementing a toll/weighbridge system, including the collection of fees by an independent contractor, to be funded by the GRZ through contracts;

(f) that maintenance equipment provided under this project shall be allocated on a first-use basis for maintenance of the T2 Road from Lusaka to Chirundu;

(g) to provide, in a timely manner, the import licenses, work permits/temporary resident visas required by personnel of the design/construction supervision contractor and construction contractor;

(h) that it will provide appropriate and timely compensation to those persons who become displaced as a result of road construction activities;

(i) to amend the existing legislation to raise penalties, to be applied on vehicles exceeding the maximum allowable weight and dimensions to realistic levels which reflect the cost of damage to the road pavement and the current monetary values as recommended in the weighbridge study prepared by Petit & Partners for the Roads Department.

Waivers:

Two waivers have been prepared: one to negotiate, in accordance with Handbook 11, Country Contracting, Chapter 2, Section 2.3.3, with a single source, Kajima Corporation, for the follow-on rehabilitation of the dual carriageway between Makeni and Lusaka; and the second for the use of engineering firm, Sheladia, Stanley, and Burrow for the additional consulting work generated by the amended Project.

Responsible AID Officer:

The officer in USAID/Zambia responsible for the project is Val Mahan in the General Development Office. The responsible officer in AID/W is Lynn Keeyes, AFR/SA/ZSSM.

Project Review Committee Action:

The Project Review Committee reviewed the Project Paper on July 19, 1993, and recommended approval subject to modifications which have now been incorporated in the Project Paper. The reporting memorandum from this meeting is included as part of this authorization package.

Notification to Congress:

A Congressional Notification (CN) for the project expired without Congressional objection on June 12, 1993.

Authority:

Per STATE 159759, the Acting AA/AFR delegated to you the authority to authorize and implement an amendment to the Regional Transport Rehabilitation II Project in an amount not to exceed \$5.5 million for a new life of project (LOP) total not to exceed \$28.84 million. The ad hoc delegation of authority is to be exercised in accordance with the terms and conditions of Delegation of Authority 551 dated March 19, 1989.

Section 4A(2) of Delegation of Authority 551 authorizes you to amend Project Authorizations executed by any A.I.D. official provided the amendment i) does not result in a total life of project funding of more than \$30 million; ii) does not present significant policy issues; iii) does not require waivers which can only be granted by the Assistant Administrator for Africa or the Administrator; and iv) does not have a project life in excess of 10 years.

Authorization of this project is within your delegated authority.

Recommendation:

That you sign the attached Project Paper Supplement, the Third Amendment to the Project Grant Agreement, and Amendment No. Two to the Project Authorization and thereby approve

.4

an additional \$5,500,000 in grant funds for the Regional Transport Rehabilitation II Project (Kafue Lusaka Road 690-0254).

Approved: Julius Mwanika
Disapproved: _____
Date: August 10, 1993

Attachments:

Project Authorization Amendment No. 2
Project Paper Supplement

Drafted: PDO: DStraley

Clearance: GDO: VMahan VM
ENG: AMHussen AM
CONT: MGweshe MG
REDSO/ESA/RLA: TFillinger (DRAFT)

AMENDMENT NO. TWO TO PROJECT AUTHORIZATION

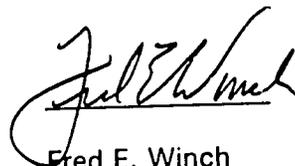
Project: Regional Transport Development II,
Kafue-Lusaka Road Rehabilitation Project (690-0254)

Country: Zambia

1. Background. The Kafue-Lusaka (KL) Road Rehabilitation Project was originally authorized on July 26, 1990, with a total life of project funding of Twenty Two Million, Eight Hundred and Forty Thousand U.S. Dollars (\$22,840,000). Amendment No. One to the Project Authorization increased the life of project by Five Hundred Thousand U.S. Dollars (\$500,000), to a total of Twenty Three Million Three Hundred and Forty Thousand U.S. Dollars (\$23,340,000). Funding under the original Project Authorization and Amendment No. One was provided to rehabilitate 49.5 kilometers of the KL Road between Kafue and Makeni, which improved the road to the outskirts of Lusaka. Project costs include design, construction and supervision services; procurement of maintenance equipment, training, evaluation and audit.

The purpose of this Amendment No. Two is to increase the total life of project funding by Five Million and Five Hundred Thousand U.S. Dollars (\$5,500,000). These funds will be used to rehabilitate the 3.6 kilometer dual carriageway of the Kafue-Lusaka road between Makeni and Lusaka in order to extend the improved road into downtown Lusaka, and to widen (from two lanes to four) the 11.1 kilometer portion of the Kafue-Lusaka road between Makeni and Chilanga.

2. Additional Funding. Pursuant to Section 496 of the Foreign Assistance Act of 1961, as amended, I hereby authorize an additional Five Million Five Hundred Thousand U.S. Dollars (\$5,500,000). The total life of project funding shall now be Twenty Eight Million and Eight Hundred Forty Thousand U.S. Dollars (\$28,840,000). The original Project Assistance Completion Date remains December 31, 1994.
3. Other Terms and Conditions. Except as modified above, all other terms and conditions of the original Authorization, as amended by Amendment No. One, shall remain in full force and effect.



Fred E. Winch
Mission Director
USAID/Zambia

DATE: August 10, 1993

I have reviewed the proposed methods of implementation and financing for this project paper supplement and find them to be appropriate. Where necessary, adequate provisions have been made for detailed assessments of financial management capacities, I therefore recommend that you approve this proposed project paper supplement.

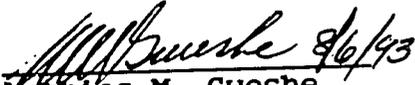

Mathias M. Gweshe
Mission Controller
USAID/Zambia

TABLE OF CONTENTS

I.	SUMMARY AND RECOMMENDATIONS	1
	A. Project Paper Supplement Summary	1
	B. Project Issues	2
	C. Recommendations	2
II.	BACKGROUND AND RATIONALE FOR SUPPLEMENT	2
	A. Background	2
	1. Rationale for Project	3
	2. Current Status of Project	3
	3. Rationale for Additional Funding	4
	B. Other Donors	4
III.	PROJECT DESCRIPTION	4
	A. Project Goal and Purpose	4
	B. Project Outputs and Inputs	5
	1. Makeni-Lusaka Rehabilitation	6
	2. Makeni-Chilanga Widening (11.1 Km.)	6
IV.	PROJECT MANAGEMENT AND IMPLEMENTATION ARRANGEMENTS	7
	A. Project Management	7
	B. Implementation Plan	8
	C. Financial Plan	8
	1. Cost Estimate Background	9
	2. Revised Cost Estimate	9
	3. Funding Obligation mechanisms	9
	4. Financial Plan	9
	5. Methods of Implementation and Financing	9
	6. Road Maintenance Fund	10
	D. Monitoring, Evaluation, and Audit Plan	12
	E. Procurement Plan	12
V.	PROJECT ANALYSES	12
	A. Technical Analysis	12
	B. Economic Analysis	13
	C. Social Analysis	13
	D. Administrative Analysis	14
	E. Environmental Analysis	15
VI.	NEGOTIATING STATUS, CONDITIONS AND COVENANTS	15

ANNEXES

- A. Log Frame**
- B. Letter of Request**
- C. Initial Environmental Examination**
- D. 611(e) Certification**
- E. Implementation Background**
- F. Economic Analysis**
- G. Technical Analysis**
- H. Statutory Checklist**
- I. Delegation of Authority Cable**
- J. Justification for Negotiation of Contract**
- K. Justification for Amending the Engineering Supervision Contract**

I. SUMMARY AND RECOMMENDATIONS

A. Project Paper Supplement Summary

USAID/Zambia intends to increase the life-of-project funding for the Regional Transport Development II, Kafue-Lusaka Road Rehabilitation Project by \$5.5 million from \$23,340,000 to \$28,840,000.

The \$5.5 million increase in funding will extend the rehabilitation of the Kafue-Lusaka Road from 49.5 kms to 53.1 kms, and upgrade a portion of the road from two lanes to four lanes. Specifically the increase in project funding includes \$1,100,000 for widening the Chilanga-Makeni portion of the road (11.1 km.) from two lanes to four lanes, \$3,300,000 for the rehabilitation of the four lane Makeni-Lusaka portion (3.625 km.), an additional \$700,000 for supervision of construction, and \$430,000 for inflation/contingencies.

The purpose of the project is to improve the efficiency of the inter-regional transport system by reducing operating costs, improving the level of service, and by extending the life of the Kafue-Lusaka Road. The Project Assistance Completion Date of December 31, 1994, will remain the same.

B. Project Issues

A Project Review Committee identified and resolved three issues with the proposed Project Paper. The identified issues were:

Negotiated Contract: The PP Supplement proposes to negotiate an amendment with the existing contractor for rehabilitation of the Makeni-Lusaka portion of the road. The lower cost of construction and unacceptable delay in tendering were given as the reasons for negotiating an amended contract instead of tendering the Makeni-Lusaka portion of the road. The Project Review Committee was concerned about the impact on the Project if the GRZ is unable to negotiate a contract with the existing contractor and is forced to tender the extension of the KL road into Lusaka. Some members on the Project Review committee felt that tendering would result in substantially higher costs which might preclude rehabilitation of the Makeni-Lusaka portion of the road. Based on consultations with REDSO/ESA/ENG, if tendering is required, the consulting engineers will lower the construction specifications. The lower specifications will still be acceptable in terms of technical feasibility and keep the costs within the Project's budget. Lower specifications would increase the need for periodic maintenance, but the increase would be acceptable as evidenced by the Chirundu-Kafue portion of the road. Tendering to a short-list of firms will not entail an extension of the Project Assistance Completion Date.

Maintenance Equipment: The Project expects to purchase routine maintenance equipment to assist the GRZ in meeting Grant Agreement Covenants. If the GRZ is unsuccessful in negotiating an amended contract with Kajima (see negotiated contract above), the Committee was concerned that a new tender would prove to be more

costly and reduce funding available for maintenance equipment. The technical members of the Committee indicated that by lowering the construction specifications, tendering would result in road construction at the same cost as with a negotiated contract and thereby maintain Project funding for maintenance equipment.

Maintenance Capability: The maintenance capability of the GRZ was reviewed at length again. The Review Committee concluded that with the new reforms to raise funding for road construction and maintenance, the long-term outlook for maintenance is good.

Women in Development: The Review Committee determined that the original Project Paper projection that 20 percent of the construction jobs would accrue to women was an error. Women are involved in construction work in rural areas close to their place of residence. Working out of isolated camps along major trunk roads is not attractive to women laborers. The Review Committee decided that since the Project will be completed within one year, activities designed to analyze the role of women in road construction or to promote the participation of women in rehabilitation along trunk roads were not feasible.

C. Recommendations

That the USAID/Zambia Mission Director approve the Project as described to provide a supplemental grant of \$5,500,000 from the Development Fund for Africa (DFA) to the Government of the Republic of Zambia (GRZ) to upgrade and extend the rehabilitation of the Kafue Lusaka road.

II. BACKGROUND AND RATIONALE FOR SUPPLEMENT

A. Background

1. Rationale for Project

SARP Regional Transport is still the most important element of the A.I.D. regional strategy for Southern Africa. Several major road systems serve intra-regional and overseas trade of the Southern Africa region. Botswana, Zambia, Malawi, Zimbabwe and Tanzania are linked through a series of road connections including the Lusaka-Kafue-Chirundu-Harare-Beira network. Although originally built to satisfactory standards, many of the regional trunk roads which serve international trade require rehabilitation. This is the result of less than adequate maintenance, excessive vehicle loads, civil disturbances and general neglect associated with a historical lack of emphasis on regional development.

Efficient transportation within the region is vitally important for economic growth and regional integration. Intra-regional trade is compromised by unreliable deliveries and costs associated with deteriorating road and rail infrastructure. Trade with the outside world is highly dependent on expensive alternative transportation routes. The present high cost of transporting the region's commodities to external markets through the ports of the

Republic of South Africa, compared with potentially lower costs through efficiently operating regional corridors, significantly increases the delivered price of goods and renders them less competitive on international markets.

Although much of the region's international trade is shipped by rail, certain types of cargo can be more efficiently moved by road. In Zimbabwe and Zambia, a missing rail link between Harare and Lusaka is supplanted by road, and a road also parallels the Livingstone-Lusaka railway. The two roads combine at Kafue for the final leg into Lusaka. Rehabilitation of the 3.6 kilometer portion of the Kafue-Lusaka road between Makeni and Lusaka is necessary because the road is not in a maintainable state due to serious deterioration of the existing surface from heavy traffic, breaking-off of the shoulders and lack of maintenance.

2. Current Status of Project

The Grant Agreement with the GRZ was signed on July 27, 1990. After two rounds of tendering, the GRZ selected Kajima Corporation in April 1992 under a host country contract to rehabilitate the road. Of the total 49.5 km length of the Kafue-Lusaka Road, the contractor has completed all site clearance and topsoil removal, constructed 40 km of embankment, placed subbase and base course for 35 km, placed 15 kms of hot mix asphalt concrete surface course and completed most of the drainage work. This progress corresponds to approximately 37.7 percent of the total cost of construction. Despite the four month delay in tendering, the contractor managed to complete mobilization two months earlier than planned. Even though significantly interrupted by the 1992 rainy season, the contractor is actually now on schedule with the original project implementation schedule. The remaining construction work is scheduled to be completed by February 1994.

3. Rationale for Additional Funding

The additional funding will be used to a) rehabilitate 3.6 Kilometers of four lane highway between the Kafue traffic circle and Makeni, construction not within the present project, and b) widen the 11.1 km. Makeni-Chilanga section, now under Project-funded rehabilitation, from two lanes to four lanes. The Mission dropped rehabilitation of the 3.6 Kms. between the Kafue traffic circle to Makeni from the original project design because the Project had insufficient funding available to it. This section of road continued to be a priority subject to the availability of additional funding. In addition, recent traffic surveys and counts carried out on the Chilanga-Makeni portion of the Kafue-Lusaka road have indicated that this section of road should be rehabilitated to a four lane highway to accommodate an increase in the level of traffic, and due to the number of slow moving vehicles and the limited opportunities for passing.

The traffic counts are only part of the story in justifying the upgrade of the Makeni-Chilanga section. Because of the current design for the road and the unit costs set out in the contract together with the contractor's plan for diversions, a variation order in the existing contract will result in the construction of the 11.1 kms of additional lanes at a marginal cost of roughly \$100,000 per km. The existing contract price for the two lane road

is roughly \$350,000 per km. This is clearly a one-time opportunity, since costs would escalate were the additional lanes to be constructed outside of a previously negotiated rate for existing work and outside of the time-frame for ongoing work.

B. Other Donors

Several other donors are quite active in road rehabilitation and maintenance in Zambia. DANIDA (Denmark) supports one senior engineer to work at the Roads Department headquarters to coordinate donor funding. Since independence, the British Overseas Development Agency (ODA) has funded expatriate staff to fill various vacancies which have existed in the Roads Department from time to time. However, ODA provision of expatriate staff to roads Department has come to an end and the last engineer will leave Zambia in October 1994. The Finish Development Agency (FINNIDA) has provided five experts to provide training on road rehabilitation, simple pavement management, and improved productivity. FINNIDA has also provided stone crushers, financed an engineering study and design of 210 km of the Livingstone-Lusaka road between Monze and Zimba. Canadian Foreign Development Assistance (CIDA) is funding the rehabilitation of graders, and the training of mechanics and operators. The Government of Japan provided funds for graders and maintenance equipment, and the construction of a bridge across the Kafue River, linking the two A.I.D. financed road projects. CIDA has also funded construction of 520 km of Class III gravel roads in Northern and Luapula Provinces to support the fishing industry and is currently rehabilitating Nos.20 champion graders. The Government of China supported the rehabilitation of the Lusaka-Kaoma road. The African Development Bank (ADB) is providing technical assistance and training to the Roads Department, and funded a study for the rehabilitation of the Chipata-Lusaka road. The EEC provided the funds for the rehabilitation of the Lusaka-Kabwe road. Finally, the World Bank is proposing an Infrastructure Engineering and Technical Assistance Review aimed at preparing an urban development and road sector project.

III. PROJECT DESCRIPTION

A. Project Goal and Purpose

The Project's goal and purpose remain unchanged. The goal of the Project is to support the development of a stronger foundation for economic growth in Southern Africa. This goal will be achieved through:

- Increased regional exports as a function of improved road reliability and concomitant transportation cost savings making products more competitive in regional markets;
- Increased extra-regional trade using more cost-effective transportation corridors; and,
- Foreign exchange savings as vehicle mechanical wear, breakdown and accident rates are reduced.

B. Project Outputs and Inputs

The Project purpose is to improve the efficiency of the inter-regional transport system by reducing operating costs and by extending the life of the road. Project-financed road reconstruction and rehabilitation will: reduce the roughness of the Kafue-Lusaka road and thereby substantially reduce vehicle operating costs, and place the Kafue-Lusaka road under effective maintenance by improving the maintenance capability of the Roads Department.

Following completion of the Project there will be: 53.1 kms of rehabilitated road, of which 15 km will be a four lane and the remaining 38.1 km will be a two lane; an annual increase in road traffic of 5.4 percent for the section north of Makeni, and 7.3 percent for the section between Makeni and Chilanga; better trained and equipped personnel at the Zambia Department of Roads; and a decrease in road accidents and vehicle breakdowns.

The change, as explained in the above summary is in the outputs. The PP supplement will add two new outputs: Makeni-Lusaka rehabilitation, and an upgrade to four lanes of the Makeni-Chilanga section.

1. Makeni-Lusaka Rehabilitation (3.6 Kilometers)

The original feasibility report for the Project included an analysis of traffic demand from the Kafue Traffic Circle to Makeni. Based on the peak hour traffic flows at that time, the consultant recommended that the road section between the Kafue Traffic Circle and Makeni should be a four lane highway with a 7.3 Meter lane width in each direction, a 3 meter wide central median strip, and a 3 meter wide shoulder. Due to funding limitations at that time, the recommended four lane section was not included in the road rehabilitation project. Consequently, the 1991 final design package, prepared by the joint venture consultant Sheladia/Stanley/Burrow (SSB), did not include the four lane section between the Kafue Traffic Circle and Makeni in their final engineering report.

On behalf of the Roads Department of Zambia, the joint venture consultant has recently carried out an assessment of the status of traffic levels on the four lane section between the Kafue Traffic Circle and Makeni. The first SSB traffic counts were carried out in August 1992 at kilometer 1, and the second SSB traffic counts were carried out in November 1992 at kilometer 3.6. From the two traffic counts and analysis, the consultant came to the conclusion that the combined growth rate in traffic between 1989 and 1992 for all vehicles was: 5.4 percent for the road segment between the Kafue Traffic Circle and Makeni; and a weighted 7.3 percent for the section between Makeni and Chilanga (km 15).

As a point of comparison, the 1989 feasibility study used a projected average traffic growth rate of 2.5 percent to predict future traffic volumes, which was based upon their perception of the economy at that time. Based on the new projection, the Roads Department proposed to A.I.D. that the existing four lane section between the Kafue Traffic Circle and Makeni be improved to a divided four-lane road with a median divider designed so that additional lanes could be expanded in the future into the median.

Since the preparation of the feasibility study in 1989, the surface course of the Makeni-Lusaka four lane section has deteriorated significantly due to the increasing

levels of traffic. Big block cracks and pot holes are appearing on the surface. In addition, the road shoulders are continuously breaking off, which decreases the already narrow three meter wide lanes.

By issuing a variation order to the SSB contract, and by using local currency counterpart funds, SSB will prepare for the Roads Department, a final design package which will contain an engineering report and contract documents. The engineering report will include investigations, deflection survey, trial pits, dynamic cone penetration tests, riding quality survey, construction material survey, and road drainage and pavement design. The contract documents will contain the Form of Agreement and associated necessary information, bill of quantities, conditions of contract Parts I and II, specifications of particular application, technical specifications, final drawings, and cost estimate.

Regarding the construction supervision costs for the rehabilitation of the Makeni-Lusaka and widening of the Makeni-Chilanga section, the Roads Department will issue an amendment to the SSB contract. The Project will provide \$700,000 for supervision costs.

The first round of tendering of the existing work under the Project was limited to contractors from A.I.D. Geographic Code 941 countries. This resulted in the submission of very high bids from two regional contractors with no American contractors submitting a bid. Subsequently, the Mission rejected the high bids and extended the tender to contractors from A.I.D. Geographic Code 935 countries. The Roads Department received a reasonable bid within the Project construction budget on the second round of tendering from Kajima Corporation (See Annex E for more implementation background). As set out in A.I.D. Handbook 11 Chapter 2 Section 2.3.3., the Mission expects the Roads Department to negotiate a contract with the existing contractor, Kajima Corporation for the additional follow-on work.

2. Makeni-Chilanga Widening (11.1 Km.)

According to the 1989 feasibility study, the predicted annual daily traffic (ADT) after 20 years (7,900 vehicles) exceeded the upper limit for a two lane road (5,000 vehicles) by the standards used by the Zambian Roads Department. In addition to this, the feasibility study considered the number of slow moving vehicles and the limited opportunities for passing due to the horizontal alignment. Consequently, the Road Department considered the option of providing a four lane highway to this section.

However, the predicted ADT after 20 years (7,900 vehicles) fell within the ADT range of 5,000-15,000 recommended by the Overseas Unit of the Transport and Road Research Laboratory (TRRL) for a two lane road. The feasibility study concluded that under TRRL standards, four lanes were not warranted for this section at that time and recommended that this section should be a class 1A road (7.3 M wide road pavement with 3 m wide road shoulders on each side of the road pavement). This conclusion was subsequently repeated by the 1991 SSB final design report for the Kafue-Lusaka Road Rehabilitation Project.

In August, 1992, the SSB consultant carried out 12 hour traffic counts for three days at three locations between the Kafue Traffic Circle and Chilanga on behalf of the Roads Department. The counting locations are the same as the points originally used in the 1989 feasibility study: kilometers 1, 7, and 10 south of the Kafue Traffic Circle. As mentioned above, the SSB consultant discovered that the combined traffic growth rate between 1989 and 1992 for all vehicles is 5.4 percent for the segment between the Kafue Traffic Circle and Makeni and a weighted 7.3 percent from the Makeni junction to Chilanga. The consultant's analysis led to the conclusion that the traffic directional split on the existing road is 60/40, the terrain varies between level and rolling and the road has a ratio of flow rate to ideal capacity equal to 1. With a passenger car equivalent factor 3 for trucks and 2 for buses, the consultant calculated that the total service two way flow rate is 1,450 vehicles per hour for a level of service E and 580 vehicles per hour for a level of service C.

For planning purposes, the consultant believes that for a newly improved highway, the level of service provided on opening year should be no less than a level of service C. The weighted average two-way peak hour traffic volume in August 1992 was 530 vehicles and in the opening year of 1994, the predicted volume will be 600 vehicles per hour or a level of service C (levels of service as well as passenger car equivalents to trucks and buses are defined in the highway capacity manual special report 209, 1989).

The SSB consultant came to the conclusion in August 1992 that the segment of roadway between Makeni and Chilanga should be improved to a four lane road. This conclusion was again confirmed by the SSB consultant in November 1992 when they carried out an additional traffic count at Makeni (km 3.9).

IV. PROJECT MANAGEMENT AND IMPLEMENTATION ARRANGEMENTS

A. Project Management

The administration of the revised activities is summarized as follows:

MISSION MANAGEMENT SUMMARY

Type of Assistance	Method of Implementation	Method of Financing	Amount in US \$
Makeni-Lusaka Rehabilitation (including contingency)	Host Country Contract Negotiated Amendment	Direct Letter of Commitment	3,700,000
Makeni-Chilanga Widening	Host Country Contract Variation Order	Direct Letter of Commitment	1,100,000
SSB Supervision	Host Country Contract Negotiated Amendment	Direct Letter of Commitment	700,000

The USAID/Zambia General Development Office has the overall responsibility for managing the Project. A Project-funded Personal Service Contract Engineer has the

implementation responsibility for the entire Project. The REDSO/ESA/UID engineer is expected to continue the practice of making quarterly visits to inspect Project progress.

B. Implementation Plan

As mentioned above (see Section II.A.2), the remaining implementation targets are within two months of the original dates. The widening of the Makeni-Chilanga section will be completed under a variation order and within the existing schedule for completion. The implementation of the Makeni-Lusaka section of road is adhering to the following schedule of events:

Preliminary report completed	03/31/93
Roads Dept review of preliminary report	04/08/93
Review of contract amendment	07/15/93
Final design package completed and reviewed	08/31/93
Complete negotiation	09/15/93
Issue letter of acceptance	09/22/93
Issue notice to proceed	09/30/93
Construction begins	10/01/93
Construction completed	11/30/94

C. Financial Plan

1. Cost Estimate Background

The original feasibility study estimated in August 1989 that the cost of construction of the Kafue-Lusaka Road from the Kafue Traffic Circle to the Kafue Bridge was \$22,979,000 including a 10 percent contingency and a detailed design and construction supervision cost of \$1,600,000. At the time, the cost of rehabilitation of the four lanes from the Kafue Traffic Circle to Makeni was estimated at \$3,028,000. By the time the Project Paper and Grant Agreement were signed, the cost of the Project without the Kafue-Makeni section came to \$22,840,000.

The road maintenance study prepared by the SSB Consultant for the Roads Department at the end of 1991 determined that the Roads Department did not need road periodic maintenance equipment for the Kafue-Lusaka road up to the year 1999 since the use of hot mix 60mm asphalt concrete surface course for the Kafue-Lusaka road results in less requirements for periodic maintenance than a road pavement with a double bituminous surface course as in the case for the Kafue-Chirundu road. The Roads Department recently confirmed in May 1993 that the road maintenance equipment purchased for periodic maintenance in 1989 under the Kafue-Chirundu Road Rehabilitation Project is still in serviceable condition. Further a recent SSB Road Maintenance Study indicated that the Roads Department will need only routine maintenance equipment for the T2 road from Chirundu to Lusaka.

2. Revised Cost Estimate

The total costs of the Kafue-Lusaka road Rehabilitation Project will be \$31,484,000. This revised estimate is based on the assumption that \$28,40,000 will be provided from A.I.D. project funds and \$3,144,000 equivalent in local currency will be provided from the GRZ.

Table I presents a summary of estimated costs and a financial plan for A.I.D. contribution. This Cost Estimate and financial Plan reflect sufficient details for project planning and current cost estimates. USAID has determined that the project cost estimates are reasonably firm for the project elements. Thus, the requirement of FAA, Section 611, (a) (1) has been satisfied.

3. Funding Obligation Mechanisms

An initial of \$22,840,000 was made in FY 1990 and subsequent obligation was made in FY 1992 of \$500,000 and final obligation is planned in FY 93 for \$5.500,000. Financially, the GRZ will be contributing Zambian Kwacha 40 million (equivalent to approximately \$80,000 using an exchange rate of \$1 = ZK500). The local currency will be used for the conceptual and final design of the makeni-Lusaka portion of the kafue-Lusaka road. The FAA Section 110 mandatory 25 percent host country contribution is not applicable to this regional project. Thus, it will enable USAID to provide the GRZ with greater budgetary flexibility during the remaining period of the project.

4. Financial Plan

Listed below are the revised major project inputs to be financed by A.I.D. and the GRZ, including inflation and contingency factors.

Table 1 (See attachment)

5. Methods of Implementation and Financing

The overall financial planning and proposed methods of financing for this project are sound. The financial management capabilities of the GRZ's implementing agencies have been reviewed and deficiencies and constraints relative to the management of U.S. government funds were identified during the project design. USAID disbursement of funds under the proposed project will continue to be made as shown in the original project paper.

6. Road Maintenance Fund

In January 1990 USAID/Zambia requested a consulting engineer (John Burrow & Partners) to assess the Road Department's past performance in

TABLE I
SUMMARY OF COST ESTIMATE AND FINANCIAL PLAN
KAFUE-LUSAKA ROAD REHABILITATION PROJECT PAPER SUPPLEMENT
(\$000s)

USE OF FUNDS	FX	(A) AID LC	(A) SUBTOTAL	(A) FX	(A) GRZ LC	(A) SUBTOTAL	ADJUSTMENT AID FX	GRZ LC	REVISED LIFE OF PROJECT AID	GRZ	GRAND TOTAL
Final Design	350.00	0.00	350.00	0.00	0.00	0.00	0.00	80.00	350.00	80.00	430.00
Construction Supervision	1,100.00	0.00	1,100.00	0.00	0.00	0.00	0.00 (B)	0.00	1,100.00	0.00	1,100.00
Construction	13,016.00	3,254.00	16,270.00	0.00	0.00	0.00	4,900.00 (C)	0.00	21,170.00	0.00	21,170.00
Maintenance Equipment	860.00	0.00	860.00	0.00	11.25	11.25	400.00	0.00	1,260.00	11.25	1,271.25
Training	20.00	0.00	20.00	0.00	18.25	18.25	0.00	0.00	20.00	18.25	38.25
PSC Engineer	735.00	0.00	735.00	0.00	0.00	0.00	0.00	0.00	735.00	0.00	735.00
Spares	425.00	0.00	425.00	0.00	0.00	0.00	0.00	0.00	425.00	0.00	425.00
Evaluation, Audits	100.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	100.00
Land Acquisition	0.00	0.00	0.00	0.00	2.50	2.50	0.00	0.00	0.00	2.50	2.50
Sinking Fund	0.00	0.00	0.00	0.00	3,000.00	3,000.00	0.00	0.00	0.00	3,000.00	3,000.00
Contingency/Inflation	2,482.00	488.00	2,980.00	0.00	32.00	32.00	200.00	0.00	3,180.00	32.00	3,212.00
GRAND TOTAL	19,098.00	3,742.00	22,840.00	0.00	3,064.00	3,064.00	5,500.00	80.00	28,340.00	3,144.00	31,484.00
PERCENTAGE									90%	10%	

NOTES TO THE FINANCIAL SUMMARY PLAN:

Information is taken from the original project paper.

Amount is based on the budget submitted by the contractor (Sheladia/Stanley/Burrow). The estimate is based on the additional costs involved in supervising the construction firm in rehabilitating the road to a four lane from Kafue Traffic Circle to Makeni.

Amount is based on the budget submitted by the construction firm (Kajima Corporation). These are the cost involved in constructing the road to four lanes.

19

maintaining A.I.D.'s prior investment in road rehabilitation since the 1980's and the GRZ's financial capability to fund adequate road maintenance. The consulting engineers identified insufficient funding for road maintenance as a primary constraint and recommended the establishment of a sinking fund to cover the costs of maintenance until the year 2000. The original project made the sinking fund a condition precedent to first disbursement and added several other subsequent conditions precedent to ensure proper maintenance of the road.

The Zambian economy has deteriorated since the preparation of the original Project Paper. The specter of continuing devaluations of the kwacha and inflation has reduced the capacity of the sinking fund to cover the future maintenance costs of the Chirundu-Lusaka road. The original Project Paper anticipated high levels of inflation (approximately 55% compounded annually over 10 years) in estimating the sinking fund requirements. In spite of the conservative calculations on the amount needed in the sinking fund, actual rates of inflation and devaluation have made the sinking fund a wasting asset in real terms. The Roads Department estimates that the sinking fund is only capable of providing for the routine maintenance this year along 81.5 kms and resealing of 41.5 kms of the Chirundu-Kafue section of the road.

Fortunately, the GRZ has acted on the recommendations of a Road Maintenance Policy Reform Seminar sponsored by the World Bank, the Ministry of Transport and Telecommunication and the Ministry of Works and Supply concerning sources of revenues for road maintenance. As a result of the seminar, the GRZ Cabinet approved the establishment of an autonomous Road Fund and the introduction of an explicit road tariff consisting of an international transit fee, vehicle license fees and a specific supplemental charge on the price of fuel. Both the World Bank and the African Development Bank are assisting the GRZ in setting fuel taxes and license fees at levels sufficient to cover road maintenance expenditures. These far reaching reforms, which will be linked to a World Bank Infrastructure, Engineering, and Technical Assistance Program, address the fundamental constraints to a sustainable road maintenance program. With the new source of funding and strategic importance of the Lusaka-Harare corridor, USAID/Zambia fully expects the GRZ to have the financial capability of complying with the Project covenant to provide the funding necessary for the maintenance of the KL road.

D. Monitoring, Evaluation, and Audit Plan

1. Monitoring

The Project's consulting engineers will continue to prepare a monthly implementation report which it submits to USAID/Zambia through the GRZ Ministry of Works and Supply Roads Department. These reports include assessment of progress to date, adherence to work plan and schedule, and a comparison of project construction expenditures with completion of physical progress.

The Project Officer, accompanied by the PSC engineer and/or REDSO/ESA Regional Engineer will continue to make on-site inspections and verify

progress toward meeting Project targets on a quarterly basis. The PSC engineer will continue to make site inspections every two weeks in conjunction with the Roads Department Project Manager. The Roads Department will continue to hold follow-up site meetings every two weeks for the consulting engineers, the construction contractor, and USAID to discuss implementation issues arising from the site visits.

2. Project Evaluation

The mid-term evaluation is being scheduled for November 1993, in accordance with the original Project design which called for an evaluation after the first (full) dry-season construction period. USAID/Zambia will be responsible for a final evaluation one year after the construction is completed. The evaluation will:

measure the achievement of the project purpose "to continue and expand efforts to improve the efficiency (making the best use of the existing resources) of the inter-regional transport system by reducing operating costs and by extending the life of the road", and

evaluate the effectiveness of the project inputs and outputs.

The project evaluation will consist of the following:

Introduction (including discussion of planned and eventual users); and

Project goals/purpose/outputs/inputs (goals and purpose should be explicit, stated with respect to what is to change in terms of results).

Among criteria to be addressed concerning this section are:

Adequacy of the rehabilitation design;

Performance of the engineering construction;

Performance of the construction contractor, specifically, whether the construction work was carried out to specification and in a timely manner;

Performance of the GRZ Roads Department in project administration;

Re-evaluation of the GRZ road maintenance capabilities;

Performance of the PSC engineer to facilitate project monitoring and implementation; and

Performance of the USAID/Zambia Project Officer, Controller, and other relevant staff.

The project purpose will be analyzed by examining the road roughness. Road roughness is a commonly accepted engineering standard of the quality of the pavement and the effectiveness of the maintenance of the pavement. It is measured using a bump integrator and is expressed in centimeters per kilometer. Pavements in good condition have a roughness of about 1500 centimeters per kilometer. Severely deteriorated pavements will have a roughness index of about 7000 to 8000 millimeters per kilometer.

Baseline data on existing road roughness were collected by the consultant and the GRZ during the development of the Project Paper, and projections of the road roughness with and without the Project were made by the consultant for the year 1989-2012. These data will provide the basic measure of the achievement of the project purpose. If the evaluation shows that the roughness is at or below the rate projected by the consultant, it can be accepted that the purpose of the project was achieved. If the measured roughness exceeds that projected by the consultant, the implication is that the project purpose is not being achieved.

E. Procurement Plan

The original USAID plan to award the rehabilitation of the Makeni-Lusaka portion of the road by tender based on the calculation that there was a period of seven months (January 1993 - July 1993) to complete the final design and tender documents, and issue and receive tenders. The intent was to adhere to A.I.D.'s principles of open competition.

However, AID/W issuance of the delegation of authority to authorize the project took longer than anticipated. An award by tender, even with shortlisted and prequalified firms could not take place until the end of 1993, with the inevitable consequence that the program could easily extend well into 1995. This would have obvious financial consequences for the project and cause the PACD to be extended.

In accordance with Handbook 11, Country Contracting, 2.3.3 Waiver - Negotiation with a Single Source, USAID/Zambia has approved a waiver of competition to permit single source negotiation.

V. PROJECT ANALYSES

A. Technical Analysis

This section summarizes the technical analysis appearing as Annex G.

The consulting engineers analyzed the technical feasibility of the road in a 1989 feasibility study. The topography, geology, rainfall, and climate of the two road sections to be funded under the amended Project remain the same. The widening of the Makeni-Chilanga section is technically feasible at minimal extra cost because the original design included three meter wide shoulders. The natural material road foundation, crushed

rock base, and hot asphalt mix of the existing two lane road will be easily extended to two additional lanes. There will be no changes in the alignment in the amended Project for either section.

Pavement of two lane sections between Kafue and Chilanga has already commenced. Site visits by USAID and REDSO/ESA indicate that the company in charge of construction has built recently completed road sections to proper standards. The construction company is also close to completing road sections close to the target dates set forth in the original Project. Based on technical evaluations by Project managers to date, USAID/Zambia is confident of the technical feasibility of the amended Project.

B. Economic Analysis

This section summarizes the Economic Analyses appearing as Annex E.

The economic and financial analysis of the costs and benefits of widening the Kafue-Lusaka road from a four lane to a six-lane road between the Lusaka traffic circle and the Makeni Road Junction are positive. The economic results indicate that widening to 3 dual-lanes and improving the road's surface to an asphalt concrete pavement of the 3.625 kilometer section is well justified. The Economic Internal Rate of Return (EIRR) was calculated at 40.03 percent. The Net Present Value (NPV) of the costs and benefits discounted at 12.0 and 15.0 percent yields present values of U.S. \$4,758,300 and \$3,674,956, respectively. The results of the benefit-cost analysis reveals a ratio of 4.57. Each of the economic tests conducted to measure the worth of undertaking the investment of \$4.37 million indicates that the project is economically sound.

The financial analysis of the proposed project also yielded results. The Financial Internal Rate of Return (FIRR) was calculated at 61.26 percent. The NPV was calculated at 12.0 and 15.0 percent and yielded U.S.\$ 8,560,711 and \$6,935,677 respectively. The benefit-cost ratio was estimated at 6.68. These financial tests reveal that the proposed investment is financially viable.

A separate analysis conducted by the Mission's Engineer and the engineering consultants found the widening of the 11.1 km from two lane to four lane to also have a positive cost-benefit ratio.

C. Social Analysis

The original Project Paper for the Kafue-Lusaka Road Rehabilitation Project underlined the importance of the Kafue-Lusaka road as an essential artery in the transport of imports and exports between Southern Africa and Central Africa. The rehabilitation-widening of the Makeni-Lusaka section and the widening from two lanes to four lanes of the Makeni-Chilanga section will result in an improved road level of service, reduced hauling time and vehicle operating costs, and enhanced safety. Regional and national commercial transporters, commercial farmers, wholesale traders and manufacturers will all benefit directly from the rehabilitation-widening works.

As demonstrated by the Kafue-Lusaka Road Rehabilitation Project, the rehabilitation work discussed in this PP supplement has created approximately 500 jobs for the local work force. This is particularly important under the present economic condition characterized by high unemployment rates. The original PP estimated that twenty percent of the local jobs would be reserved for women based on discussions held with private contractors at the time. Except for the provision of services for the work gangs such as the preparation of food, the construction contractor for the Kafue-Lusaka road employs only men in the road works. Apparently the prevailing customs and traditions are that only men present themselves for road rehabilitation work.

On the major trunk roads, women do work on rural road rehabilitation and maintenance in the districts in which they live. It is, however, important to note that with the increased traffic, a new food market has been started by women along the road. Greater market activity of this nature is expected over time.

All passengers will benefit from the improved shoulders, laybys, and improved road surface in terms of reduced transport time, comfort and safety. People living within the immediate impact zone will benefit from the bus stops. Pedestrians will be provided with walkways beyond the side ditches in the Makeni-Lusaka section and wider shoulder (1.8 meters) in the Makeni-Chilanga section.

Indirect beneficiaries include communities in neighboring countries who will be able to have access to essential commodities such as kerosene, petrol and relief food supplies, as a result of the road rehabilitation works. Rural and urban consumers in Zambia will benefit from the improved efficiency in marketing.

People who have businesses within the right-of-way and who become displaced as a result of the road works will be compensated by the Roads Department with funds withdrawn from the sinking fund as required by a covenant in the Grant Agreement amendment. In both the Makeni-Lusaka section and Makeni-Chilanga section, there will be no changes in the alignment of the road. In both sections, the diversions will be located parallel to the existing road. The construction contractor will be required to minimize the disruptions caused by the diversions.

D. Administrative Analysis

The Roads Department of the Ministry of Works and Supply will continue to be the counterpart agency responsible for the implementation of the Project. Adequate staffing has been an ongoing problem at the Roads Department, particularly at the managerial and professional level.

While the Roads Department has had problems in hiring and retaining staff, this has not been a deterrent to Project implementation. All the road rehabilitation work has been contracted out to a construction firm which has been supervised by consulting engineers.

USAID/Zambia found during the preparation of the original Project Paper that the Roads Department had the institutional capability to maintain the road. The Project is funding training for Roads Department staff in road maintenance management. The Roads Department also plans to contract substantial portions of its maintenance work to private contractors. With the management training and private sector contracting, USAID/Zambia does not foresee an institutional problem related to road maintenance.

E. Environmental Analysis

The Africa Bureau Environmental Officer with concurrence of Africa General Counsel approved an Initial Environmental Examination for the amended Project on April 5, 1993.

VI. NEGOTIATING STATUS, CONDITIONS AND COVENANTS

Among other clauses, Section 5.2 Additional Covenants of the Grant Agreement requires the Grantee:

to carry out appropriate maintenance on the Kafue-Lusaka and Kafue-Chirundu roads; and

to provide additional funds, above those amounts otherwise required by conditions precedent, to the extent necessary to ensure adequate maintenance of the T2 road from Lusaka to Chirundu.

Based on concern for the adequacy of funding available for road maintenance, Section 4.2 will be strengthened with additional Conditions Precedent to Award of Construction Contract to include:

1. The GRZ will provide A.I.D. with an updated road maintenance plan, in form and substance satisfactory to A.I.D., describing the steps it plans to take to ensure proper maintenance of the road from Chirundu to Lusaka, after project rehabilitation is completed, as well as the schedule of resources to be made available for this purpose;
2. The GRZ will start resealing, repair shoulders, clear ditches, put up road signs, within the 1993 dry season, in at least 40 kilometers of the Kafue-Chirundu road as originally planned by the Roads Department;
3. The GRZ will re-initiate operation of weighbridge at Kafue; and
4. The GRZ will provide A.I.D. a letter of commitment, in form and substance satisfactory to A.I.D. providing assurances that all land required to complete the proposed road rehabilitation as amended between Lusaka and Chilanga has been acquired.

Section 5.2, Additional Covenants will also be amended to include:

1. The GRZ covenants to carry out appropriate maintenance of the T2 road from Chirundu to Lusaka and to make provisions for the necessary staffing, training, equipment and funding to achieve this purpose.
2. The GRZ covenants that it will provide additional funds, above those amounts otherwise required by conditions precedent, to the extent necessary to ensure adequate maintenance of the T2 road from Chirundu to Lusaka.
3. The GRZ covenants to increase private sector involvement in road maintenance to supplement the activities of the Roads Department and proceed to create a more favorable business environment for consultants and contractors with the intention of building the country's road maintenance capacity.
4. The GRZ covenants to amend the existing legislation (Statutory Instrument No. 84 of 1990) to raise the maximum laden weight from 24,000 kilograms to 48,000 kilograms in line with the neighboring countries as recommended in weighbridge study prepared by Petit & Partners for the Roads Department.
5. The GRZ covenants to undertake a study, to be separately funded by A.I.D., to review options relating to toll collection, tariffs, weighbridge operations, and funds management for the purpose of controlling vehicle loading and providing funds to maintain the Chirundu - Lusaka road. Options will include, but not be limited to, amalgamation of toll and weighbridge functions and implementing a toll/weighbridge system, including the collection of fees by an independent contractor, to be funded by the GRZ through contracts.
6. The GRZ covenants that maintenance equipment provided under this project shall be allocated on a first-use basis for maintenance of the T2 Road from Lusaka to Chirundu.
7. The GRZ covenants to provide, in a timely manner, the import licenses, work permits/temporary resident visas required by personnel of the design/construction supervision contractor and construction contractor.
8. The GRZ covenants that it will provide appropriate and timely compensation to those persons who become displaced as a result of road construction activities.
9. The GRZ covenants to amend the existing legislation to raise penalties, to be applied on vehicles exceeding the maximum allowable weight and dimensions to realistic levels which reflect the cost of damage to the road

pavement and the current monetary values as recommended in the weighbridge study prepared by Petit & Partners for the Roads Department.

USAID/Zambia and the Ministry of Works and Supply agree on all aspects of the Project. USAID/Zambia expects the amended Grant Agreement to be signed shortly after authorization.

27

LOGICAL FRAMEWORK

KAFUE-LUSAKA ROAD REHABILITATION PROJECT
(690-0254)

GOAL	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
To support the development of a stronger foundation for economic growth in Southern Africa.	Increased regional exports as a function of improved road reliability and concomitant transportation cost savings making regional products more competitive in SADCC markets.	National and regional statistics. Survey of export industries.	Transportation corridor investments maintained by SADCC countries.
	Increased extra-regional trade using more cost effective SADCC transportation corridors.	National and regional statistics. Survey of export industries.	No major disruption of social and political stability in the SADCC region generally and in Zambia in particular.
	Foreign exchange savings as vehicle mechanical wear, breakdown and accident rates are reduced.	Transportation industry cost analysis. National budget accounts.	Continued regional cooperation.

28

LOGICAL FRAMEWORK

KAFUE-LUSAKA ROAD REHABILITATION PROJECT
(690-0254)

PURPOSE -----	(END OF PROJECT STATUS) -----	MEANS OF VERIFICATION -----	ASSUMPTIONS -----
To improve the efficiency of the inter-regional transport system by reducing operating costs and by extending the life the road	Roughness of the Kafue Lusaka road & corresponding vehicle operating costs are substantially reduced.	Road roughness by end of construction should be approx. 1500 mm per km (B1).	Percentage of overloaded trucks will not increase above the 1985 levels.
	Kafue-Lusaka road placed under effective maintenance.	Road roughness in the year 2000 should be less than 1800 mm per km (B1).	Seasonal climate patters and meteorogical events (flooding, extreme heat) fall within anticipated norms and do not negate or diminish effectiveness of road resealing.
	Road maintenance capability of Dept. of Roads improved.	Dept. of Roads institutional analysis and review of operations of sinking fund and efficiency of supply/ utilization of A.I.D. financed equipment and spares.	GRZ will successfully implement policy reforms such as adequate financing of road maintenance included in current structural adjustment program.

LOGICAL FRAMEWORK

KAFUE-LUSAKA ROAD REHABILITATION PROJECT
(690-0254)

OUTPUTS -----	MAGNITUDE -----	MEANS OF VERIFICATION -----	ASSUMPTIONS -----
Rehabilitation of 53.1 kms. between the Kafue Traffic Circle in Lusaka and Kafue.	53.1 kms. complete reconstruction	Construction supervision contractor progress reports.	Demographic and economic activity trends remain within forecast limits.
Widening from two lanes to four lanes of 11.1 kms. between Makeni and Chilanga.	11.1 kms. of widening from two lanes to four lanes	Construction contractor reports. Site inspections. Payment vouchers. Project evaluations. Traffic counts.	
Widening from four lanes to six lanes of 3.6 kms. between the Kafue Traffic Circle in Lusaka and Makeni.	3.6 kms. of widening from four lanes to six lanes.		
Road maintained.	Road roughness in the year 2000 reduced to 1800 mm/km. (BI) from present 3800 mm/km. (BI).	A.I.D. Project Manager oversight.	Training recipients remain with the Roads Dept. upon completion of training.
Trained and equipped personnel at Roads Dept.	84 persons from the Roads Dept. trained and installed in strategic maintenance positions. Maintenance equipment to provide incremental capability for 104 kms. of road resealing and road routine per year made available to the Lusaka Provincial Roads Engineer who is responsible for the Kafue-Lusaka road.	Project implementation review reports.	Unforeseen factors do not increase costs beyond the capacity of the project.

20

LOGICAL FRAMEWORK

KAFUE-LUSAKA ROAD REHABILITATION PROJECT
(690-0254)

INPUTS	FUNDING TARGETS (\$)	MEANS OF VERIFICATION	ASSUMPTIONS
-----	-----	-----	-----
Road construction services.	23,290,000	Project Manager reports	Project inputs are provided
Final design/construction supervision services.	3,900,000	Contract document.	in a timely fashion.
Maintenance equipment	400,000	Payment vouchers.	
Training	20,000	Site inspections.	
PSC Project Management	486,000		
Evaluation and audit	100,000		
Commodities	49,000		
Contingency	595,000		
	----- 28,840,000		

14



REPUBLIC OF ZAMBIA
MINISTRY OF WORKS AND SUPPLY

P.O. BOX 50236
LUSAKA

20th October, 1992

The Director,
U.S.A.I.D.,
LUSAKA.

ACTION FEW	DLÉ DATE 3/1
TRANSFER VM	INFO
ACTION TAKEN	
DATE	INITIALS

KAFUE-LUSAKA ROAD REHABILITATION PROJECT (690-0254) PROJECT
EXTENSION FROM MAKENI TO THE SOUTH ROUNDABOUT

The Lusaka-Kafue Rehabilitation Project is well conceived project and will no doubt stand out as a worthwhile venture for many years to come.

I am quite pleased about progress which is on schedule so far. Recent traffic studies by the joint Venture supervising the project Messrs. Scheladia/Stanley/Burrow show that the road section between Makeni junction and the South Roundabout will be a bottleneck, as this section will constrict traffic. It is the view of my Ministry that the Makeni to the South Roundabout be considered for improved traffic capacity.

On the basis of the above observation, the GRZ through the Ministry of Works and Supply requests the government of the United States of America, through you to Finance the improvement of the Makeni to the South Roundabout Road Section.


M. Mufwazi
Permanent Secretary
MINISTRY OF WORKS AND SUPPLY

c.c. The Director of Roads, LUSAKA.

32

Communications should be addressed to
the Permanent Secretary
Telephone: LUSAKA 226751/4
Telegrams: WORKS, RIDGEWAY, LUSAKA
Telex: ZA 40290



REPUBLIC OF ZAMBIA

MINISTRY OF WORKS AND SUPPLY

ROADS DEPARTMENT
P.O. BOX 8088
LUSAKA

7th December, 1992.

The Director
USAID
LUSAKA

Dear Sir,

Re: KAFUE-LUSAKA ROAD REHABILITATION PROJECT
WIDENING OF THE SECTION BETWEEN CHILANGA AND MAKENI
JUNCTION

In August 1992 the Joint Venture Consultant made further traffic counts at three locations between the Kafue Roundabout and Chilanga. The locations are the same as those used for the 1989 study.

The Consultants prepared a report based upon the new traffic data in which they recommended that the section of the project road from Chilanga to the Makeni Junction be widened to four lanes. In December they up-dated their traffic analysis using the 1985 Highway Capacity Manual. This new analysis supported the previous recommendation.

The estimated cost to provide four lanes is \$1.1 million. Because of the need for a four lane facility, the Roads Department respectfully requests assistance from USAID in providing the necessary funds to widen the improvement from Chilanga to Makeni Junction from two lanes to four lanes.

Yours faithfully,


T. Ngoma
DIRECTOR OF ROADS

c.c. The Permanent Secretary
Ministry of Works & Supply
LUSAKA.

c.c. The Permanent Secretary
Ministry of Finance
LUSAKA.

**INITIAL ENVIRONMENTAL EXAMINATION
OF
CATEGORICAL EXCLUSION**

PROJECT COUNTRY: Zambia

PROJECT TITLE AND NO: Kafue-Lusaka Road Rehabilitation Project (690-0254)

FUNDING: FY 91 - 94 US \$23,340,000

FUNDING (PROJECT MODIFICATION): FY 93 - 94 US \$ 5,500,000

IEE PREPARED BY: A. M. Hussen, Eng. USAID/Zambia **AA**

ENVIRONMENTAL ACTION RECOMMENDED: Positive Determination _____
Negative Determination X _____
Categorical Exclusion _____
Deferral _____

SUMMARY OF FINDINGS:

Rehabilitation of the Kafue-Lusaka road was identified as a priority project for donor assistance by the SADCC Council of Ministers and currently appears in the transport sector Programme of Action as Project 1.8.3. It has also been given a high priority in the USAID/Zimbabwe-sponsored assessment of regional transportation projects based on such criteria as economic feasibility, regional impact and absorptive capacity. Efficient transportation in the Southern African Region is vitally important for economic growth and regional integration. The rehabilitation of the 3.6 km. four lane road between the Kafue Traffic Circle in Lusaka and Makeni and the widening to four lanes of the 11.1 km. Makeni-Chilanga Road is proposed as part of the regional transport development program. Successful project implementation will reduce transportation costs, reduce accidents and breakdown rates and will accommodate projected annual traffic increases and extend the life of the road.

The rehabilitation of the 3.6 kilometre Kafue Traffic Circle-Makeni is necessary because the road is not in a maintainable state due to serious deterioration of the existing surface and shoulders from heavy traffic and lack of maintenance. The widening of the Makeni-Chilanga road from two lanes to four lanes is needed to meet the growing traffic demand.

- 2 -

In 1989, USAID/Zimbabwe and the Bureau Environmental Officer/AFR/TR/ANR approved an IEE which provided the justification for the negative determination of the environmental impact of the Kafue-Lusaka Road Rehabilitation Project (690-0254). Except for further land use which will remain within the present right of way, the environmental impact of the widening to four lanes of the 11.1 km. Makeni-Chilanga road is still the same as that discussed in the 1989 IEE. This IEE will reconfirm the 1989 IEE negative determination for the Makeni-Chilanga road and will discuss the environmental impact of the rehabilitation of the 3.6 km. four lane road between the Kafue Traffic Circle and Makeni.

Environmental impacts of the modifications to the existing project will be either minimally negative (land use), temporarily negative (atmosphere, water quality, natural resources) or neutral (cultural). The widening of the Makeni-Chilanga road from two lanes to four lanes and rehabilitation of the Kafue Traffic Circle-Makeni to a divided four lane road to reduce accidents and headlight glare at night, the construction of busbays, laybys, entrance and exit lanes at important intersections and the provision of international road signs represent a clear benefit in improved safety to road users. The overall environmental impact of the project will be minimal. In view of the above discussion, a negative determination is requested, as there will not be any significant negative impact on the environment.

CONCURRENCE:

J. J. Gaudet
Bureau Environmental Officer:
John J. Gaudet, AFR/ARTS/FARA

APPROVED:
DISAPPROVED:
DATE: 4/5/93
DATE: 4/6/93

CLEARANCE: GC/AFR: : MA Kewman

CLEARANCE:

V. Mahan/GDO/USAID/Zambia
D. Straley/PDO/USAID/Zambia
J. Wiebler/PROG/USAID/Zambia
B. Kosheleff/A/DIR/USAID/Zambia
M. Latif/REDSO/ESA/REO
R. Rose/REDSO/ESA/ENG
T. Filinger/REDSO/ESA/RLA

REDSO
2/27/93
REDSO fax dated 2/27/93
REDSO fax dated 2/27/93
REDSO fax dated 2/27/93



U.S. AGENCY FOR
INTERNATIONAL
DEVELOPMENT

JUL 23 1993

ACTION MEMORANDUM FOR THE ACTING ASSISTANT ADMINISTRATOR

FROM: Keith E. Brown, AFR/SA *KEB*

SUBJECT: Updated 611(e) Certification for the Regional Transport
Development II Project; Kafue-Lusaka (KL) Road
Rehabilitation Project (690-0255)

Problem: USAID/Zambia proposes to amend the KL Road Rehabilitation Project to add \$5.5 million in funding in order to rehabilitate the final 3.6 kms of road from Makeni to the Kafue-Lusaka Traffic Circle and to widen 11.1 kms of road from Makeni to Chilanga. An updated 611(e) certification was prepared for the amended Project (see Attachment 1). You are requested to favorably take into consideration the updated 611(e) certification prior to the authorization of additional funds for the Project.

Background: In May, 1990, the prior Mission Directors for Zambia and Zimbabwe signed a 611(e) certification that the Government of the Republic of Zambia had the financial and human resource capability to maintain and utilize the Kafue-Lusaka (KL) road after completion of the Project-funded rehabilitation. Their certification was based on a thorough assessment in January 1990 by the engineering consultant, John Burrow & Partners, of the Road Department's past performance in maintaining A.I.D.'s prior road rehabilitation projects since the early 1980's, and of the GRZ's financial capability to adequately fund road maintenance.

The January 1990 assessment identified future funding for road maintenance as a primary constraint and recommended the establishment of a maintenance sinking fund to cover KL road maintenance costs until the year 2000. The original Project Grant Agreement made the establishment of a sinking fund a condition precedent to first disbursement and added several other conditions precedent to ensure proper maintenance of the road. These conditions precedent included the submission of a road maintenance plan, start-up operation of a weigh-bridge station near the Kafue Bridge, completion of a study of the whole system for enforcing weight limitation, and the resealing of a road section rehabilitated under Phase I of the Project.

Since project implementation started, two facets of the Project designed to ensure proper maintenance and protection of the

7/30

-2-

A.I.D. funded road have encountered difficulties. The GRZ's weigh-bridge station malfunctioned shortly after start-up and dramatic devaluations of the kwacha have significantly reduced the value of the sinking fund.

Fortunately, the GRZ acted on the recommendations of a Road Maintenance Policy Reform Seminar sponsored by the World Bank and the Ministry of Transport and Telecommunication concerning sources of revenue for road maintenance. As a result of the seminar, the GRZ Cabinet approved the establishment of an autonomous Road Fund and the introduction of an explicit road tariff consisting of an international transit fee, vehicle license fees and a specific supplemental charge on the price of fuel. Both the World Bank and the African Development Bank are assisting the GRZ to set fuel, taxes and license fees at levels sufficient to cover Central and Provincial Road Departments' expenditures. These far reaching reforms, which will be linked to the World Bank Infrastructure, Engineering, and Technical Assistance Program, address the fundamental constraints to a sustainable road maintenance program. With the new source of funding and strategic importance of the Lusaka-Harare corridor, USAID/Zambia fully expects the GRZ to have the financial capability to comply with the Project covenant to provide the funding necessary for the maintenance of the KL road.

In addition, the Kafue-Lusaka Road Rehabilitation Project provides foreign exchange for the procurement of periodic and routine maintenance equipment and spare parts to be used for the future maintenance of the A.I.D.-funded road. It also provides local currency for the training of 36 Roads Department field mechanics and a senior engineer in road maintenance planning and management. The Kafue weigh-bridge will return to normal operation in August, and the GRZ will implement several Project-funded recommendations designed to improve national monitoring and control of commercial truck loads.

Several other donors, such as FINNIDA, DANIDA, NORAD, CIDA, ODA and JICA are providing technical assistance, road construction equipment and the funds for the rehabilitation of various segments of the road network in Zambia. The African Development Bank is providing technical assistance and training for Roads Department staff and has funded a study for the rehabilitation of the Lusaka-Chipata road. The European Economic Community provided the funds for the rehabilitation of the Lusaka-Kabwe road. The World Bank, under the Third Highway Project, assisted the Roads Department in improving its road maintenance capabilities. In addition, the World Bank's Infrastructure Engineering and Technical Assistance Program is providing assistance for a road sector and an urban development project.

Both REDSO/ESA/ENG and USAID/Zambia have reviewed past A.I.D. road investments in Zambia and the capacity of the Roads

-3-

Department to maintain these, as well as the proposed new projects. Both have concluded that the GRZ and the Roads Department will have the financial and human resources capacity to effectively maintain and utilize the Project-funded road as rehabilitated under the amended Project given the training that is being provided, improved operation of weigh-bridges, other donor assistance, rapid movement towards improved revenue policy for road construction and maintenance, and covenant by the GRZ to provide the required funding for the KL Road maintenance.

Authority: Under Delegation of Authority No. 404 you have, without authority to redelegate, the authority to receive and take into consideration Mission Director 611(e) certifications as to the capability (both financial and human) of a host country to effectively maintain and utilize capital projects estimated to cost in excess of \$1 million.

Recommendation: That you sign below indicating that you have favorably taken into consideration the updated 611(e) certification from the USAID/Zambia Mission Director for the amended Kafue-Lusaka Road Rehabilitation Project.

Approved: *J. F. Nolan*

Disapproved: _____

Date: 7/31/93

Attachment:

1. 611(e) Certification Regional Transport Development II; Kafue-Lusaka Road Rehabilitation (690-0255)

Drafted: USAID/Zambia/PDO:DStraley:AID/W/AFR/SA:Sanderson:6/14/93:
TRANS.MEM

Clearance:

USAID/Zambia/ADIR: BKosheleff	<u>(draft)</u>	date	<u>7/13/93</u>
USAID/Zambia/PRM: JWiebler	<u>(draft)</u>	date	<u>7/15/93</u>
USAID/Zambia/ENG: AHussan	<u>(draft)</u>	date	<u>7/13/93</u>
USAID/Zambia/GDO: VMahan	<u>(draft)</u>	date	<u>7/13/93</u>
REDSO/ESA/RLA: TFillinger	<u>(draft)</u>	date	<u>7/13/93</u>

AID/W

AFR/SA: RHarber	<u>(draft)</u>	date	<u>7/15/93</u>
AFR/SA: LTaylor	<u>(draft)</u>	date	<u>7/20/93</u>
GC/AFR: MAKleinjan	<u>(draft)</u>	date	<u>7/23/93</u>
A-DAA/AFR: TBork	<u><i>[Signature]</i></u>	date	<u>7/28/93</u>

[Handwritten mark]

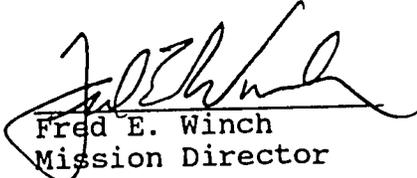
SECTION 611(e) CERTIFICATION

REGIONAL TRANSPORTATION DEVELOPMENT II: PROJECT AMENDMENT

I, Fred E. Winch, the principal officer of the Agency for International Development in the Republic of Zambia, having taken into account, among other things:

- the maintenance and utilization of projects in Zambia previously financed or assisted by the United States;
- commitments by the Government of the Republic of Zambia to provide, by the end of the project, adequate resources to maintain the project road;
- the likelihood of A.I.D. and/or other donor support for projects to improve Zambia's road maintenance capability; and
- the Government of the Republic of Zambia's present commitment of financial and other resources to road maintenance activities;

do hereby certify that in my judgement the Government of the Republic of Zambia has both the financial capability and human resources capability to effectively maintain and utilize the capital assistance to be carried out under this project.


Fred E. Winch
Mission Director

Date: 29 June 1993

AP
Drafted: A. Hussein/ENG, D. *Straley*/PDO

Clearance:

V. Mahan/GDO/USAID/Zambia 
B. Kosheleff/A/DIR/USAID/Zambia 
R. Braden/REDSO/ESA/ENG 
T. Fillinger/REDSO/ESA/RLA 

611(e) Justification

In May 1990, the prior Mission Directors for Zambia and Zimbabwe certified that the Government of the Republic of Zambia had the financial and human resource capability to maintain and utilize the Kafue-Lusaka (KL) road after completion of the Project-funded rehabilitation. Their certifications were based on a thorough assessment in January 1990 by the engineering consultant, John Burrow & Partners, of the Road Department's past performance in maintaining A.I.D.'s prior investments in road rehabilitation since the early 1980's, and of the GRZ's financial capability to fund adequate road maintenance.

The January 1990 assessment identified insufficient funding for road maintenance as a primary constraint and recommended the establishment of a sinking fund to cover the costs of maintenance until the year 2000. The original project made the sinking fund a condition precedent to first disbursement and added several other subsequent conditions precedent to ensure proper maintenance of the road. These were: submission of a road maintenance plan, start-up operation of a weighbridge station near the Kafue Bridge, completion of a study of the whole system for enforcing weight limitation, and the resealing of road sections rehabilitated under Phase I of the Project.

Since project implementation started, two facets of the Project designed to ensure proper maintenance and protection of the Chirundu-Lusaka road have encountered difficulties. The weighbridge station malfunctioned shortly after start-up operation and economic conditions have eroded the purchasing power of the sinking fund beyond the original estimates.

The weighbridge station was an electronic-based system which stopped working two months after its installation. The GRZ was unable to repair it until recently. The GRZ is replacing the electronic weighbridge with a mechanical weighbridge which is expected to be more functional. The GRZ will use the recently repaired electronic weighbridge as a portable weighing station. To further improve the enforcement of weight limits, USAID/Zambia will include adoption of the recommendations of the study of the national system of weighbridge stations as covenant to approval of the contract for the rehabilitation the Makeni-Lusaka portion of the road. With the operation of the Kafue Bridge weigh station and improved national monitoring, the wear and tear to the Chirundu-Lusaka road from high axle loads will be reduced.

The Zambian economy has deteriorated since the preparation of the original Project Paper. The specter of continuing devaluations of the kwacha and inflation has reduced the capacity of the sinking fund to cover the future maintenance costs of the Chirundu-Lusaka road. The original Project Paper anticipated high levels of inflation (approximately 55% compounded annually over 10 years) in estimating the sinking fund requirements. In spite of the

conservative calculations on the amount needed in the sinking fund, actual rates of inflation and devaluation have made the sinking fund a wasting asset in real terms. The Roads Department estimates that the sinking fund is only capable of providing for the routine maintenance this year along 81.5 kms and resealing of 41.5 kms of the Chirundu-Kafue section of the road.

Fortunately, the GRZ has acted on the recommendations of a Road Maintenance Policy Reform Seminar sponsored by the World Bank and the Ministry of Transport and Telecommunication concerning sources of revenues for road maintenance. As a result of the seminar, the GRZ Cabinet approved the establishment of an autonomous Road Fund and the introduction of an explicit road tariff consisting of an international transit fee, vehicle license fees and a specific supplemental charge on the price of fuel. Both the World Bank and the African Development Bank are assisting the GRZ in setting fuel taxes and license fees at levels sufficient to cover Central and Provincial Road Departments expenditures. These far reaching reforms, which will be linked to a World Bank Infrastructure, Engineering, and Technical Assistance Program, address the fundamental constraints to a sustainable road maintenance program. With the new source of funding and strategic importance of the Lusaka-Harare corridor, USAID/Zambia fully expects the GRZ to have the financial capability of complying with the Project covenant to provide the funding necessary for the maintenance of the KL road.

In addition, the Kafue-Lusaka Road Rehabilitation Project provides foreign exchange for the procurement of periodic and routine maintenance equipment and spare parts to be used for the future maintenance of the Chirundu-Kafue-Lusaka road. It also provided local currency for the training of 36 Roads Department field mechanics and a senior engineer in road maintenance planning and management. Two other senior engineers are also scheduled to go for training in road maintenance planning and management.

Several other donors, such as FINNIDA, DANIDA, NORAD, CIDA, ODA and JICA are providing technical assistance, road construction equipment and the funds for the rehabilitation of various segments of the road network in Zambia. The African Development Bank is providing technical assistance and training for Roads Department staff and has funded a study for the rehabilitation of the Lusaka-Chipata road. The European Economic Community provided the funds for the rehabilitation of the Lusaka-Kabwe road. The World Bank, under the Third Highway Project, assisted the Roads Department in improving its road maintenance capabilities. In addition, the World Bank's Infrastructure Engineering and Technical Assistance Program is aimed at preparing a road sector and an urban development project.

Both REDSO/ESA/ENG and USAID/Zambia have reviewed past A.I.D. road investments in Zambia and the capacity of the Roads Department to maintain these as well as the proposed new projects. Both have concluded that the GRZ and the Roads Department will have the financial and human resources capacity to effectively maintain and

utilize the Project-funded road as rehabilitated under the amended Project given the: training that is being provided, improved operation of weigh-bridges, other donor assistance, rapid movement towards improved revenue policy for road construction and maintenance, and covenant by the GRZ to provide the required funding for the KL Road maintenance.

43

Implementation Background

The final design contract between the Roads Department/ Ministry of Works and Supply (MOWS) of the Government of Zambia (GRZ) and the joint venture Consultant Sheladia/Stanley/Burrow (SSB) was signed on February 7, 1991 at a total contract sum of \$3,272,329. Under the terms of this contract, the SSB Consultant provided six professional engineering and technical advisors to: review the feasibility study prepared by John Burrow & Partners; and prepare the final design drawings, technical specifications, and tendering and contract documents.

As soon as the contract was signed, the SSB Consultant mobilized and started gathering information on available space for project office, living quarters for their expatriate staff, organized transport, equipment, labor and technicians for the assistant geotechnical engineer. They collected and reviewed existing maps, reports, past axle loading surveys, and briefly looked at possible material sources. The Consultant also reviewed the geotechnical investigation findings in the preliminary engineering report which was followed by field trips to correlate the report with the road features. By the end of February, marking of the chainages on the existing pavements for use in the identification of field samples was 70% complete and the excavation of trial pits was 15% complete.

In March, the Benkleman Beam and the Dynamic Cone Penetration tests were 90% completed and the excavation of trial pits started with the testing of materials. The Consultant continued the review of the available data including the AASHTO guidelines concerning pavement underdrains for possible inclusion into the design, available topographic maps, the availability of locally produced precast concrete culvert products and studied traffic maintenance plans. The Consultant also inspected the road sections with damaged and/or deformed pavement due to improper or insufficient drainage facilities. On March 2 USAID/Zambia Engineer attended a site inspection tour of the road which was arranged by the Roads Department and the Consultant and on March 19, the Consultant held an inception meeting with the Roads Department.

By April, the Consultant completed the Benkleman tests, the Dynamic Cone Penetration test and the bump integrator measurements for both lanes of the road. The search for suitable gravel borrow pits and quarry for crushed rock started. The Consultant carried out an inspection of existing drainage structures to determine salient features that need correction to restore them functionally, field surveys of culverts to determine flow line characteristics, estimation of major catchment area, estimation of run-off in order to determine the adequacy of existing drainage facilities and investigation of the course of heavy erosion, silting and culvert showing structural distress. The Chief Engineer started a review of the design and geometric criteria, field review and inventory of major road junctions and access points. The tendering process started with the preparation of drafts of advertisements to contractors for publishing in the local newspapers in Zambia, in the neighboring countries in the sub-continent and in the Commerce Business Daily. The

43

Consultant also prepared a draft of the contractor prequalification criteria and reviewed the bill of quantities and cost estimate in the feasibility study.

By May, all the geotechnical investigations, axle load surveys, calibration of bump integrator and the identification of the source of bitumen, cement, sand, and water were identified. The Consultant passed to the alternative road rehabilitation limits analysis and proceeded with the review of the drainage system, maintenance of traffic plans, and preparation of construction drawings. On May 6, the Consultant submitted a draft copy of the pre-qualification criteria to the Roads Department and to AID for review and approval and on May 20, an advertisement was placed in the local Zambian newspapers regarding the invitation to tenders. The draft preliminary engineering report which contained all the above works became ready at the end of May.

The preliminary engineering report was completed on June and the final design of the drainage system started with the side drains and ditches, stepped drains for the side ditches, embankment drains, erosion protection for heavy erosion area, details of additional culverts, and replacement of culvert extensions in this section of the road between Km. 8.3 and 27.5. The Consultant proceeded with the study of the maintenance of the traffic plans, preparation of the construction drawings. The Consultant submitted to the Roads Department and to AID a draft copy of an environmental report, draft contract specifications and tender documents which included the invitation to tenders, instruction to tenderers, tender form of agreement and prequalification form. By the end of June, the Consultant prepared the Conditions of Contract Part II, and the Specifications of Particular Application, while the completed final engineering report was in production and submitted an environmental report for review and approval.

The First Round of Tendering

All together the following 14 Companies or Joint Ventures submitted prequalifying information including one telexed offer on July 5, 1991:

- | | | |
|----|---|----------|
| 1. | Morrison Knudsen Corporation | USA |
| 2. | American International Contractors Inc. | USA |
| 3. | Joint Venture of: | |
| | - Nello L. Teer | USA |
| | - Couch Inc. | USA |
| | - J. J. Lowe (as subcontractor) | Zambian |
| 4. | Zakhem - Pepe | USA |
| 5. | Lodigiani- (USA) Construction | |
| | - Parent Company | Italian |
| 6. | Joseph Reipl - Registered in Zambia, | |
| | - Parent Company | German |
| 7. | Joint Venture of: | |
| | - Construction Associates | Lesotho |
| | - Construction Associates (Private) | Zimbabwe |

8.	- Delkins Ltd. Wade Adams - Using Minestone (Zambia) as subcontractor	Zambia Zimbabwe
9.	Capricorn Construction (Pty) Ltd.	Botswana
10.	Gulliver Consolidated Ltd.	Zimbabwe
11.	Partizanski Put - (Zambia) Ltd. - Registered in Zambia - Parent Company	Yugoslav
12.	IRCC - Telexed Offer	India
13.	Kajima Corporation	Japan
14.	Becco-Bahrya Engineering & Contracting Co. Ltd.	Tanzania

The Roads Department submitted to A.I.D. for concurrence an SSB report on July 24, 1992 which examined the prequalification forms submitted by each of the interested contractors with regard to nationality eligibility according to AID Handbook 11, financial position and past history, relevant experience over the past six years, and proposed project control including staffing and plant allocation. With this criteria, the Consultant came up with a shortlist of four contractors and in PIL No. 10, USAID/Zambia requested the Roads Department to include Nello L. Teer/Couch in the list of prequalified firms because they could not be disqualified on the grounds that Couch was owned by a Danish firm. The following prequalified list of five contractors received the IFB:

1.	Morrison Knudsen Corporation	USA
2.	American International Contractors Inc,	USA
3.	Capricorn Construction (Pty) Ltd.	Botswana
4.	Gulliver Consolidated Ltd.	Zimbabwe
5.	Joint Venture of Nello L. Teer/Couch Inc.	USA

In a fax dated August 13, Zakhem - Pepe protested to the Zambia National Tender Board that according to the SSB Project Manager their firm had not prequalified. Zakhem - Pepe provided the Tender Board information which, in their opinion, was sufficient to prequalify them for the tender. In another fax dated August 20, 1991, Zakhem - Pepe requested the SSB Project Manager to advise them as to the specific A.I.D. sections that affected their prequalification if they were still considered not prequalified. However, the SSB report submitted by the Roads Department to A.I.D. on July 24, 1991, explained that Zakhem - Pepe Inc. is a corporation that formed in 1991 between Pepe, an established American contractor, and Zakhem International Construction Limited which is registered in Jersey, Chanel Islands and is wholly owned subsidiary of Zakhem International SA, Luxembourg. This report concluded that Zakhem - Pepe Inc. failed to prequalify on nationality grounds and this decision was later communicated to Zakhem - Pepe by the Roads Department.

The Roads Department was then notified by a letter from Morrison Knudsen that American International Inc. (AICI) was not eligible for the job because of its ownership. AICI was involved in a dispute with USAID/Egypt stemming from disagreements about the validity of its U.S. ownership. During the time of bid preparation,

15

a final decision was issued by AID/W which disqualified AICI from the job in Egypt which required Code 000 eligibility. AID/W was consulted to determine whether AICI would nevertheless be eligible for a contract limited to 000 and 941; the answer was no. AICI is owned by Code 935 owners and was informed that it would not be eligible for this job for essentially the same reasons.

Nello L. Teer/Council did not attend the September 4, 1991 mandatory site visit and was subsequently disqualified. Even though prequalified, Morrison Knudsen later indicated that they were not interested in the job because it was too small. With this, no American firm submitted a bid.

On November 22, 1991, only Capricorn Construction and Gulliver Consolidated were left to submit the following bids:

Contractor	Kwacha	Exch. Rate	US Dollars
Capricorn	1,723,860,000	78.5	21,960,000
Gulliver	1,843,300,411	78.62009	23,445,425

The Tender Evaluation Report submitted by the SSB Consultant to the Roads Department and to A.I.D. analyzed the bids submitted by Capricorn and Gulliver and pointed out that both bids were unbalanced and unreasonably high. In a letter dated November 27, 1991, the Roads Department explained that payment of 20 % of the contract sum (Clause 14 Instructions to Tender, Vol. 1) in US Dollars at the official exchange rate effective the first day of the month for which an invoice is prepared and the exclusion of contractors from Geographic Code 935 countries may be the source of the high bids. The Roads Department concluded that the bids submitted by Capricorn and Gulliver should be summarily rejected in their present form and that if a competitive negotiation does not yield desired results, another avenue open is to open the competition to contractors from Geographic Code 935 countries. On December 9, 1991, the Roads Department and USAID/Zambia discussed the advantages and disadvantages of opening negotiations with Capricorn and Gulliver and came to the conclusion that since both tenders were unbalanced, there is not much that would be gained in the negotiation and that it was better to solicit new bids.

The Second Round of Tendering

With Project Implementation Letter No. 13, A.I.D. approved the rejection of high bids from Capricorn and Gulliver, retendering the contract, distribution of a new IFB to shortlisted firms from Geographic Code 935 Countries, and corrections to the original IFB. To reduce the eventuality of high bids, A.I.D. suggested adjusting a portion of the Contract Price to reflect price escalation by using the price indexes of certain construction materials and labor and that in no event shall these adjustments together with all other provisions of the contract exceed 110% of the contract. Both the price index and the official Kwacha exchange rates affected only 20% of the total

construction price while the remaining 80% of the total cost of construction was to be paid at the official Kwacha exchange rate effective 28 days before opening the bids with no adjustments for price escalation.

On July 5, the pre-qualification forms were received from eight interested contractors from Geographic Code 935 countries and on July 22, the Consultant submitted an evaluation report on the prequalification of contractors to the Roads Department with a copy to A.I.D. In the same period, the Consultant submitted a draft of the Specifications of Particular Application, Method of Measurement, Technical Specifications. The final engineering report and the bill of quantities were close to completion.

In January, 1992 four addenda to the tenders were issued. The first addendum provided the use of an escalation formula which affected only 20 percent of the total contract price and which took into account the escalation of prices of locally purchased construction material and labor. Eighty percent of the contract price was to be paid at the official exchange rate effective 28 days before opening the bids. The second addendum made minor changes in the tender document volume 1 and in the conditions of Contract Volume 2. At the request of some contractors, the third addendum changed the date for receiving tenders from January 24 to February 7, 1992. This addendum also provided answers to 12 questions raised by some contractors. The fourth addendum further developed further the escalation formula and established the source of the indices for labor to be used in the formula.

On February 7, 1992, the following six tenders were received:

Contractor	Kwacha	US Dollar Equivalent	Exchange rate
Partizanski Put	1,576,135,134	16,993,591	92.7488
Kajima Corp.	1,624,000,000	17,828,081	91.09225
Cogefarimesit	1,708,386,000	19,031,420	89.76666
Phoenix Vej	1,794,293,331	20,438,703	87.7890
Lendor (Overseas)	1,927,942,169	21,253,301	90.7126
Fortunato Federici	2,101,049,376	23,065,073	91.09225

The official exchange selling rate on the 10th of January as quoted by the Bank of Zambia and obtained by the Consultant from Citibank was 91.09225 Kwacha per 1 US Dollar.

Since Partizanski was the lowest bidder, the SSB Project Manager made a trip to Tanzania to look the status of Partizanski Put's construction contracts in that country. Upon return, SSB prepared a tender evaluation report which was submitted to the Roads Department on February 26, 1992. The report indicated that the tender submitted by Partizanski Put could not be considered a responsive and responsible tender

in the sense that they were behind schedule in a number of construction contracts in Tanzania and in Zambia on the Kafue-Mazabuka Road Rehabilitation Project.

In addition to their tender that conformed to the Contract documents's Bill of Quantities Kajima's tender form included an alternative proposal which consisted of three changes. The first change deleted the double bituminous surface treatment and replaced it with a 60 mm thick asphaltic hot mix and replaced the plan's 150 mm crushed rock with an average 50 mm levelling base course. The second change eliminated the crushed rock in the shoulders and replaced it with natural gravel subbase material. The third change provided a 100mm x 200mm concrete flush kerb located between the road pavement structure and the shoulder. The Consultant submitted to the Roads Department a report which contained the analysis of the Kajima alternative.

NEGOTIATION WITH KAJIMA

Negotiation between the Roads Department, represented by the Consultant and Kajima Corporation took place on the 13th to the 17th of March of 1992. Kajima made an alternative proposal which was accepted by the Roads Department and AID at a contract price of K1,566,751,000 equivalent to \$17,199,609. The proposal consisted of stabilized shoulders on each side of road pavement, a 60mm asphaltic concrete hot mix wearing course, a 150mm crushed rock base on top of a 200 - 250 mm thick natural material subbase. On this basis, the Roads Department and Kajima Corporation signed the construction contract for the rehabilitation of the Kafue-Lusaka Road on April 16, 1992 and fixed the project completion date at February 25, 1994.

CONSTRUCTION PHASE

On April 22, 1992, the Roads Department issued the Notice to Proceed to Kajima Corporation and a few weeks later USAID/Zambia issued the Mobilization Loan of \$1,688,788 to the Contractor. Kajima started mobilizing by renting a site facility at Km 5.25 along the road and by moving a convoy of equipment and supplies from Mbeya in Tanzania to Lusaka on the 13th of April. Convoys were scheduled to shuttle between Mbeya and Lusaka on a weekly basis and by the end of May, Kajima mobilized 60 pieces of equipment at the project site facility. The works completed in May included construction of the contractor's office, Resident Engineer's office, living quarters for the Tanzanian staff, mess hall, a ware house and the installation of a Caltex fuel tank. At the end of April kajima had on the job 4 Japanese nationals, 26 Tanzanians and 24 local staff and by the end of May the Japanese staff became 5, the Tanzanians 33 and the locals increased to 75.

By the end of June 1993, Kajima Corporation performed a lot of work. A main diversion parallel to the project road between kms. 30 and 44.7 has been completed and work on a parallel diversion between kms. 44.7 and km. 52 had started. Removal of topsoil has been completed to km. 53.135 and compaction of existing ground

had been completed to about km 49 and between kms. 52. and 53.165. Bulk earthworks was in progress between kms. 44 and 49 while preparations of subgrade to formation level was nearing completion between km. 38.2 and 40. The construction of subbase has been completed from km. 16.85 to km. 36.475. Approximately 39,200 meters of flush concrete curb has been laid. Base course work continued to about km. 34 and the placing of asphalt hot mix pavement between km. 22 and km. 30. Substantial quantity of aggregate for concrete and asphalt work had been stockpiled at the rock quarry as well as graded crushed rock material produced for the base course. Most of the cross and access culverts are also in place.

ECONOMICAL AND FINANCIAL APPRAISAL OF THE KAFUE-LUSAKA ROAD EXTENSION

Introduction

This section presents the economic and financial analysis of improving a 3.625 kilometer section of the Kafue-Lusaka road between the Makeni Road Junction and the Lusaka traffic circle. The proposed civil works involves widening from two lanes to a dual 3-lane road and upgrading to an asphalt concrete pavement surface. The section investigates two principal issues. What are economic and financial internal rates of return of undertaking the proposed civil works? Do the estimated benefits of the project justify making an investment of U.s. \$4.37 million to improve the Kafue-Lusaka road?

Existing Conditions of the Kafue-Lusaka Road

The existing road is situated in level terrain and has four 3-meter wide travel lanes that lead into a traffic circle south of Lusaka's Central Business District (CBD). The design speed at two curves on the road is 80 kph. Light pole obstructions exist at some 1.3 meters from the edge of the outside travel lanes. Recent traffic counts and capacity analysis of the road indicate that the required number of lanes on the existing facility to achieve a Level of Service (LOS) B in one direction by 1995 is 3.0 lanes.¹

Main Benefits of the Project

The main benefits to be derived from improving the 3.625 kilometer section of road to a dual 3-lane bituminous surface road between the traffic circle and Makeni Road Junction on the Kafue-Lusaka road are related to: 1) savings in vehicle operating costs due to road geometrics and surface improvements and 2) savings in travel time as a result of a free flow of traffic due to an increase in the number of travel lanes and avoidance of congestion on the approach to the traffic circle. Additional benefits derive from savings in road maintenance expenditures and a plan to carrying out routine and periodic maintenance. Although other benefits such as a reduction in road accidents are also expected from the project improvement, they were not included in the economic and financial analysis because of the difficulty of quantifying such benefits due to a lack of data.

Traffic Data

¹ A capacity analysis of the proposed road project was beyond the scope of the present investigation. However, John Burrow and Partners conducted a capacity analysis of the existing road based on the Highway Capacity Manual. Their results revealed that the required number of lanes in one direction for the existing facility for Levels of Service (LOS) B, C, D, and E, with E being the worst condition were respectively 3.9, 2.9, 2.3, and 1.8 by 1995. the Burrow capacity analysis shows that the existing facility is operating near LOS E during peak hour flow and will operate at LOS F during peak hours by 1995. In other words, traffic conditions are likely to deteriorate in the future if the existing facility is not improved by widening to at least 3-dual lane road and with a new pavement surface.

According to traffic data provided by John Burrow and Partners, traffic conflicts occur between Makeni Road Junction and the Lusaka traffic circle. These are caused at Lumumba road and Chawama road intersections and are attributed to turning movements from the Kafue-Lusaka road on the Lumumba and Chawama roads.²

As revealed in Table 1, north-bound traffic is the dominant direction of traffic during the morning peak hour. This is expected since the traffic mix consists largely of private passenger cars and light utility vehicles traveling into Lusaka's Central Business District (CBD).

Table 1
12-hour Traffic Counts at Kilometer 1.0
on the Kafue-Lusaka Road

	Vehicle Type	North Bound	South Bound	Total
1.	Private Cars and Light Utilities	4,433	4,270	8,703
2.	4-wheel Drive Mini-Buses	2,944	2,846	5,790
3.	2-3 Axle Light Trucks	829	956	1,785
4.	2-3 Axle Trucks with Trailer	17	28	45
5.	Articulated Trucks	173	235	408
6.	Buses	117	116	233
	12 Hour Total	8,513	8,451	16,964
	Peak Hour	962	1,171	-
	Percentage of 12-Hour Volume	11.3	13.9	-

Source: Prepared for USAID/Zambia by John Burrow, January 1993

Traffic Growth

Traffic on the Kafue to Lusaka road has been regularly counted over the period from 1989 through 1992. The traffic counts show an annual growth rate for the total traffic stream of 7.6 percent. Conversely, as Table 2 indicates two and three-axle light trucks and buses declined by 4.8 and 11.0 percent respectively, such decline in traffic was more than offset by the substantial increase in the annual growth of articulated trucks. These traffic

² This conclusion is based on 12-hour traffic counts taken over three days in August of 1992 by John Burrow and Partners.

growth rates should be viewed with caution. A data series of only three years is not adequate to make medium to long-run projections about traffic mix or the growth in volume. A five to eight year series or longer will produce a sounder empirical basis to estimate future traffic growth. Additionally, medium to very heavy truck does not appear to represent a significant share of the total traffic stream particularly during peak hour. Truck traffic as a whole account for less than fifteen percent of the total traffic stream.

Articulated trucks on the Kafue-Lusaka road increased at an annual rate of 58.3 percent over the last three years. Such increase is largely attributed to the relaxation of trade restrictions with South Africa. Undoubtedly, such a high level of growth for articulated trucks is not likely to be sustained over the medium to long term. A significant decline in the growth rate for articulated traffic is a more probable outcome. Such a decline is expected to be more in line with the growth rate of the national and local economy.

For purposes of the economic and financial analysis, a growth rate of 7.6 percent for the total traffic stream between 1994 and 1998 was assumed. There afterwards, a more realistic traffic growth rate of 3.8 percent is assumed over the remaining life of the project. This is consistent with previous studies conducted by John Burrow and Partners and with the results shown in Table 2.

Table 2
Traffic Volumes and Growth on the Kafue-Lusaka Road, 1989-1992

Vehicle Type	Growth Rate (in percent)
Passenger Cars, Light Utilities and Mini-buses	+ 8.4
2-3 Axle Light Trucks	-4.8
2-3 Axle Trucks with Trailer	3.2
Articulated Trucks	+ 58.3
Buses	-11.0
Total Traffic Stream	+ 7.6

Source: Prepared by John Burrow & Partners for USAID/Zambia, January, 1993

Traffic Composition

Recent traffic counts indicate a traffic mix of predominately passenger cars and light utility vehicles. As revealed by Table 3, passenger cars and light utility vehicles account for 51.3 percent of the total 12-hour peak traffic stream at kilometer 1.0. on the Kafue-Lusaka road.

52

The average daily traffic (ADT) on the Makeni Road to Lusaka traffic circle is presented in Table 3. Some 85.6 percent of the traffic mix or 17,799 vehicle per day are composed of passenger cars, light utility vehicles and light commercial vehicles. While medium to very heavy truck account for under 13 percent of the total vehicle mix.

Table 3
Average Daily Traffic on the Kafue-Lusaka Road Extension by Vehicle class

Vehicle Class	ADT	Percent of Total
Passenger Cars, Light Utilities	10,688	51.3
Light Commercial Vehicles	7,111	34.1
Buses	285	1.4
Medium Trucks	2,192	10.2
Heavy Trucks	56	0.27
Very Heavy Trucks	502	2.41
Total Traffic in VPD	20,834	100.0

Source: Data provided by USAID/Zambia and own estimates, May 1993

Vehicle Operating Costs

Transport costs on the road are based on operating typical vehicles over a given road surface at varying speeds. The main costs components of vehicle operating cost are consumption of petroleum products i.e. fuel, oil and lubricants; wear and tear on tires; consumption of spare parts; maintenance costs; driver's wage or crew costs; vehicle idling time and vehicle depreciation.

Vehicle operating costs are driven by different road design standards and varying road surface conditions and road geometrics. They are also influenced by vehicle prices, vehicle ages, loads, and engine power. Operating cost factors combine to influence vehicle speeds and the wear and tear of the vehicle.

Vehicle operating costs can be grouped into two categories consisting of fixed cost and variable costs. Fixed cost are those costs incurred as a result of owning the vehicle. These costs include licenses fees, taxes, insurance and depreciation. By contrast, variable costs or more precisely running costs include those costs incurred as a result of putting the vehicle into service. Variable costs include fuel, oil and lubricant consumption, tire consumption, maintenance repair cost crew costs, and idling costs.

Road Improvement and Maintenance Costs



Cost estimates, not of taxes of the Kafue-Lusaka Road improvement are given in Table 4. The estimated cost of civil works including construction costs are engineering supervision are U.S. \$4.43 million. The road improvement works will include widening of 3.625 kilometer section of the Kafue-Lusaka Road between the Kafue Traffic Circle in Lusaka to makeni Junction. The works will involve widening the existing road from four lanes to six lanes. Additional civil works include upgrading the road surface to an asphalt concrete pavement. The proposed improvements are expected to start in 1994 and are to be completed within one year.

Table 4
Cost Estimate for the Kafue-Lusaka road Extension Improvement
(in U.S. Dollars)

Item	Cost
Civil Works	2,979,60
Preliminaries	446,390
Contingencies	274,000
Total Construction Cost	3,700,000
Engineering Supervision	730,000
Grand Total	4,430,000

Source: USAID/Zambia, April 1993

Road maintenance costs are assumed for purposes of this analysis to be sunk costs. This is due to the fact that a road maintenance fund was established as part of the original Kafue-Lusaka Road Rehabilitation project.³ However, road maintenance costs will be included as a cost component of the sensitivity analysis to test extent to which variations in the estimated costs and benefits will influence the outcome of the project's economic and financial worth.

Economic and Financial Appraisal of the Kafue-Lusaka Road Extension Improvement

Evaluation Methodology

Reductions in vehicle operating costs are the most direct benefits that accrue to users of the improved road under a regime of open competitive markets. As previously indicated savings in vehicle operating costs and travel time costs form the basis of the economic

³ Sunk costs are defined here as the maintenance costs (fund) the Government of Zambia is required to maintain this road project. These costs were incurred by the Government of Zambia although not utilized before this economic evaluation. Because of the condition precedents between the Government of Zambia and USAID/Zambia on the Kafue-Lusaka Road Rehabilitation Project, such costs cannot be avoided and therefore should be excluded for the purpose of deciding the project's worth.

54

and financial analysis. Savings in vehicle operating costs are derived from improving a road such as in the case of widening and upgrading the surface. Because such improvements results in a free flow of the traffic, increased speeds, due to changes in the road surface conditions and geometrics, the costs for operating vehicles over the improved road are lowered.

In transport economic and financial analysis lower vehicle operating costs are captured as savings or benefits. The resulting benefits are then annualized and discounted by an appropriate discount rate and then projected over the useful life of the improved road facility. To determine the project's worth, the discounted benefits are then compared with discounted construction and maintenance costs of improving and maintaining the road facility over the same time horizon. This method produces the internal rate of return. If the internal rate of return is greater than the opportunity cost of capital, the project is considered to be economically justified.

The Net Present Value (NPV) method requires the benefits minus the cost stream over the life of a road project to be discounted to the present at a predetermined discount rate. The decision criterion is to accept or reject a project according to whether the NPV is positive or negative or more precisely greater than or less than zero.

Another method of determining a project's worth is to take the ratio of the total discounted benefit stream to the total discounted cost stream discounted. If this ratio result in a value greater than 1.0, the project is considered worth the investment. These same procedures are applied when conducting a financial appraisal of an improved road facility. However, the methods differ in that the economic analysis is conducted net of taxes and duties.

The basis data requirements for conducting an economic and financial internal rate of return analysis of a road project include:

- Traffic profile of existing traffic volumes and classifications vehicles
- Vehicle operating costs by vehicle class for different road conditions
- Road geometrics such as road widths, length, surface type, design speed, etc. and
- Construction and Maintenance costs per kilometer.

Economic and Financial Return Analysis

Based on the road improvement works an economic life of fifteen years was assumed. The economic and financial analysis of the costs and benefits of widening the Kafue-Lusaka road from a four lanes to a six-lane road between the Lusaka traffic circle and the Makeni Road Junction are presented in Tables 5 and 6. The economic results indicate that widening to 3 dual-lanes and improving the road's surface to an asphalt concrete pavement of the 3.625 kilometer section is well justified. The economic internal Rate of

return (EIRR) was calculated at 40.03 percent. The net Present value (NPV) of the costs and benefits discounted at 12.0 and 15.0 percent yields present values of U.S. \$4,758,300 and \$3,674,956, respectively. The results of the benefit-cost analysis reveals a ratio of 4.57. Each of the economic tests conducted to measure the worth of undertaking the investment of U.S. \$4.37 million indicate that the project is economically sound.

The financial analysis of the proposed project also yield results. The Financial Internal Rate of return (FIRR) was calculated at 61.26 percent. The NPV was calculated at 12.0 and 15.0 percent and yielded U.S. \$8,560,711 and \$6,935,677 respectively. The benefit-cost ratio was estimated at 6.68. These financial tests reveal that the proposed investment is financially viable.

Sensitivity Analysis

A sensitivity analysis was conducted to systematically determine the effects of variations in the costs and benefits of the project. Circumstances such as an increase in the cost of construction due to construction delays or overestimation of traffic growth and traffic volume can result in substantial variations in the estimated project costs or benefits or both. A sensitivity analysis was carried out to determine the effects of an overall decrease in benefits by 20 percent and by a cost increase of 20 percent. Although unlikely, the possibility exists that the economic life of the project maybe less than 15 years as the economic analysis assumed. This could result from the government of Zambia not fulfilling its commitment to release adequate funds to properly maintain the road. In light of such an outcome, a sensitivity analysis was carried out assuming an economic life of the proposed project of 10 years.

The results of the sensitivity analysis indicate that an increase of 20 percent in the capital costs of the proposed improvement has only a marginal impact on the project's economic and financial viability. Similar results are achieved when the user savings or the project's economic benefits are reduced by 20 percent or when the economic life of the project is shortened from fifteen years to ten years. Each sensitivity scenario, as revealed in Tables 5.1 to 6.3, indicate that the investment remain economically and financially justified.

Table 5
KAFUE-LUSAKA ROAD EXTENSION PROJECT
ECONOMIC COST ANALYSIS
(WITH VEHICLE OPERATING COST SAVINGS ONLY)

Units: U.S.\$

Road Length: 3625 km

Year	COSTS			BENEFITS		DISCOUNT FACTOR AT .12		
	Construction Costs	Maintenance Costs	Total Costs	User Savings	Total Benefits	Discounted Costs	Discounted Benefits	Discounted Net Benefits
1994	\$4,370,000	\$0	\$4,370,000	\$0	\$0	\$3,902,410	\$0	(\$3,902,410)
1995		\$0	\$0	\$2,794,249	\$2,794,249	\$0	\$2,227,016	\$2,227,016
1996		\$0	\$0	\$3,006,612	\$3,006,612	\$0	\$2,140,708	\$2,140,708
1997		\$0	\$0	\$3,235,114	\$3,235,114	\$0	\$2,057,533	\$2,057,533
1998		\$0	\$0	\$3,480,983	\$3,480,983	\$0	\$1,973,717	\$1,973,717
1999		\$0	\$0	\$3,613,260	\$3,613,260	\$0	\$1,831,923	\$1,831,923
2000		\$0	\$0	\$3,750,564	\$3,750,564	\$0	\$1,695,255	\$1,695,255
2001		\$0	\$0	\$3,893,086	\$3,893,086	\$0	\$1,572,807	\$1,572,807
2002		\$0	\$0	\$4,041,023	\$4,041,023	\$0	\$1,458,809	\$1,458,809
2003		\$0	\$0	\$4,194,582	\$4,194,582	\$0	\$1,350,655	\$1,350,655
2004		\$0	\$0	\$4,353,976	\$4,353,976	\$0	\$1,249,591	\$1,249,591
2005		\$0	\$0	\$4,519,427	\$4,519,427	\$0	\$1,161,493	\$1,161,493
2006		\$0	\$0	\$4,691,165	\$4,691,165	\$0	\$1,074,277	\$1,074,277
2007		\$0	\$0	\$4,869,430	\$4,869,430	\$0	\$998,233	\$998,233
2008		\$0	\$0	\$5,054,468	\$5,054,468	\$0	\$924,968	\$924,968
2009		\$0	\$0	\$5,246,538	\$5,246,538	\$0	\$855,186	\$855,186
	\$4,370,000	\$0	\$4,370,000	\$60,744,476	\$60,744,476	\$3,902,410	\$22,572,170	\$18,669,760

FIRR: 52.31%
 NPV: @12% 6,949,741
 @15% 5,554,215
 B/C Ratio: 5.78

Note: User savings are the net difference in vehicle operating costs between the without project case and the with project case.

Table 5.1
KAFUE-LUSAKA ROAD EXTENSION PROJECT
ECONOMIC COST ANALYSIS
(WITH VEHICLE OPERATING COST SAVINGS ONLY)

Road Length: 3.625 km Sensitivity Analysis of Increase in Capital Costs by 20% Units: U.S.\$

Year	COSTS		Total Costs	BENEFITS		DISCOUNT FACTOR AT .12		
	Construction Costs	Maintenance Costs		User Savings	Total Benefits	Discounted Costs	Discounted Benefits	Discounted Net Benefits
1994	\$5,244,000	\$0	\$5,244,000	\$0	\$0	\$4,682,892	\$0	(\$4,682,892)
1995		\$0	\$0	\$2,794,249	\$2,794,249	\$0	\$2,227,016	\$2,227,016
1996		\$0	\$0	\$3,006,612	\$3,006,612	\$0	\$2,140,708	\$2,140,708
1997		\$0	\$0	\$3,235,114	\$3,235,114	\$0	\$2,057,533	\$2,057,533
1998		\$0	\$0	\$3,480,983	\$3,480,983	\$0	\$1,973,717	\$1,973,717
1999		\$0	\$0	\$3,613,260	\$3,613,260	\$0	\$1,831,923	\$1,831,923
2000		\$0	\$0	\$3,750,564	\$3,750,564	\$0	\$1,695,255	\$1,695,255
2001		\$0	\$0	\$3,893,086	\$3,893,086	\$0	\$1,572,807	\$1,572,807
2002		\$0	\$0	\$4,041,023	\$4,041,023	\$0	\$1,458,809	\$1,458,809
2003		\$0	\$0	\$4,194,582	\$4,194,582	\$0	\$1,350,655	\$1,350,655
2004		\$0	\$0	\$4,353,976	\$4,353,976	\$0	\$1,249,591	\$1,249,591
2005		\$0	\$0	\$4,519,427	\$4,519,427	\$0	\$1,161,493	\$1,161,493
2006		\$0	\$0	\$4,691,165	\$4,691,165	\$0	\$1,074,277	\$1,074,277
2007		\$0	\$0	\$4,869,430	\$4,869,430	\$0	\$998,233	\$998,233
2008		\$0	\$0	\$5,054,468	\$5,054,468	\$0	\$924,968	\$924,968
2009		\$0	\$0	\$5,246,538	\$5,246,538	\$0	\$855,186	\$855,186
	\$5,244,000	\$0	\$5,244,000	\$60,744,476	\$60,744,476	\$4,682,892	\$22,572,170	\$17,889,278

EIRR: 42.58%
NPV: @12% 6,252,882
@15% 4,875,525
B/C Ratio: 4.82

Note: User savings are the net difference in vehicle operating costs between the without project case and the with project case.

Table 5.2
KAFUE-LUSAKA ROAD EXTENSION PROJECT
ECONOMIC COST ANALYSIS
(WITH VEHICLE OPERATING COST SAVINGS ONLY)

Road Length: 3.625 km Sensitivity Analysis of a Decrease in User Savings by 20% Unit: U.S.\$

Year	COSTS		Total Costs	BENEFITS		Discounted Costs	Discounted Benefits	Discounted Net Benefits
	Construction Costs	Maintenance Costs		User Savings	Total Benefits			
1994	\$4,370,000	\$0	\$4,370,000	\$0	\$0	\$3,902,410	\$0	(\$3,902,410)
1995		\$0	\$0	\$2,235,399	\$2,235,399	\$0	\$1,781,613	\$1,781,613
1996		\$0	\$0	\$2,405,289	\$2,405,289	\$0	\$1,712,566	\$1,712,566
1997		\$0	\$0	\$2,588,091	\$2,588,091	\$0	\$1,646,026	\$1,646,026
1998		\$0	\$0	\$2,784,786	\$2,784,786	\$0	\$1,578,974	\$1,578,974
1999		\$0	\$0	\$2,890,608	\$2,890,608	\$0	\$1,465,538	\$1,465,538
2000		\$0	\$0	\$3,000,451	\$3,000,451	\$0	\$1,356,204	\$1,356,204
2001		\$0	\$0	\$3,114,469	\$3,114,469	\$0	\$1,258,245	\$1,258,245
2002		\$0	\$0	\$3,232,818	\$3,232,818	\$0	\$1,167,047	\$1,167,047
2003		\$0	\$0	\$3,355,665	\$3,355,665	\$0	\$1,080,524	\$1,080,524
2004		\$0	\$0	\$3,483,181	\$3,483,181	\$0	\$999,673	\$999,673
2005		\$0	\$0	\$3,615,542	\$3,615,542	\$0	\$929,194	\$929,194
2006		\$0	\$0	\$3,752,932	\$3,752,932	\$0	\$859,421	\$859,421
2007		\$0	\$0	\$3,895,544	\$3,895,544	\$0	\$798,586	\$798,586
2008		\$0	\$0	\$4,043,574	\$4,043,574	\$0	\$739,974	\$739,974
2009		\$0	\$0	\$4,197,230	\$4,197,230	\$0	\$684,149	\$684,149
	\$4,370,000	\$0	\$4,370,000	\$48,595,581	\$48,595,581	\$3,902,410	\$18,057,736	\$14,155,326

EIRR: 40.62%
NPV: @12% 4,862,914
@15% 3,764,684
B/C Ratio: 4.63

Note: User savings are the net difference in vehicle operating costs between the without project case and the with project case.

**KAFUE-LUSAKA ROAD EXTENSION PROJECT
ECONOMIC COST ANALYSIS
(WITH VEHICLE OPERATING COST SAVINGS ONLY)**

Table 5.3

Road Length: 3.625 km

Sensitivity Analysis of a 10-Year Project Life

Units: U.S.\$

Year	COSTS			: BENEFITS		: DISCOUNT FACTOR AT 12		
	Construction Costs	Maintenance Costs	Total Costs	User Savings	Total Benefits	Discounted Costs	Discounted Benefits	Discounted Net Benefits
1994	\$4,370,000	\$0	\$4,370,000	\$0	\$0	\$3,902,410	\$0	(\$3,902,410)
1995		\$0	\$0	\$2,794,249	\$2,794,249	\$0	\$2,227,016	\$2,227,016
1996		\$0	\$0	\$3,006,612	\$3,006,612	\$0	\$2,140,708	\$2,140,708
1997		\$0	\$0	\$3,235,114	\$3,235,114	\$0	\$2,057,533	\$2,057,533
1998		\$0	\$0	\$3,480,983	\$3,480,983	\$0	\$1,973,717	\$1,973,717
1999		\$0	\$0	\$3,613,260	\$3,613,260	\$0	\$1,831,923	\$1,831,923
2000		\$0	\$0	\$3,750,564	\$3,750,564	\$0	\$1,695,255	\$1,695,255
2001		\$0	\$0	\$3,893,086	\$3,893,086	\$0	\$1,572,807	\$1,572,807
2002		\$0	\$0	\$4,041,023	\$4,041,023	\$0	\$1,458,809	\$1,458,809
2003		\$0	\$0	\$4,194,582	\$4,194,582	\$0	\$1,350,655	\$1,350,655
2004		\$0	\$0	\$4,353,976	\$4,353,976	\$0	\$1,249,591	\$1,249,591
	\$4,370,000	\$0	\$4,370,000	\$36,363,449	\$36,363,449	\$3,902,410	\$17,558,014	\$13,655,604

IRR: 51.90%
 NPV: @12% 5,892,672
 @15% 4,816,372
 B/C Ratio: 4.50

Note: User savings are the net difference in vehicle operating costs between the without project case and the with project case.

Table 6
KAFUE-LUSAKA ROAD EXTENSION PROJECT
FINANCIAL COST ANALYSIS
(WITH VEHICLE OPERATING COST SAVINGS ONLY)

Road Length: 3.625 km

Units: U.S.\$

Year	COSTS			: BENEFITS		: DISCOUNT FACTOR AT 12		
	Construction Costs	Maintenance Costs	Total Costs	User Savings	Total Benefits	Discounted Costs	Discounted Benefits	Discounted Net Benefits
1994	\$4,370,000	\$0	\$4,370,000	\$0	\$0	\$3,902,410	\$0	(\$3,902,410)
1995		\$0	\$0	\$3,225,669	\$3,225,669	\$0	\$2,570,858	\$2,570,858
1996		\$0	\$0	\$3,470,820	\$3,470,820	\$0	\$2,471,224	\$2,471,224
1997		\$0	\$0	\$3,734,602	\$3,734,602	\$0	\$2,375,207	\$2,375,207
1998		\$0	\$0	\$4,018,432	\$4,018,432	\$0	\$2,278,451	\$2,278,451
1999		\$0	\$0	\$4,171,132	\$4,171,132	\$0	\$2,114,764	\$2,114,764
2000		\$0	\$0	\$4,329,635	\$4,329,635	\$0	\$1,956,995	\$1,956,995
2001		\$0	\$0	\$4,494,161	\$4,494,161	\$0	\$1,815,641	\$1,815,641
2002		\$0	\$0	\$4,664,940	\$4,664,940	\$0	\$1,684,043	\$1,684,043
2003		\$0	\$0	\$4,842,207	\$4,842,207	\$0	\$1,559,191	\$1,559,191
2004		\$0	\$0	\$5,026,211	\$5,026,211	\$0	\$1,442,523	\$1,442,523
2005		\$0	\$0	\$5,217,207	\$5,217,207	\$0	\$1,340,822	\$1,340,822
2006		\$0	\$0	\$5,415,461	\$5,415,461	\$0	\$1,240,141	\$1,240,141
2007		\$0	\$0	\$5,621,249	\$5,621,249	\$0	\$1,152,356	\$1,152,356
2008		\$0	\$0	\$5,834,856	\$5,834,856	\$0	\$1,067,779	\$1,067,779
2009		\$0	\$0	\$6,056,580	\$6,056,580	\$0	\$987,223	\$987,223
	\$4,370,000	\$0	\$4,370,000	\$70,123,162	\$70,123,162	\$3,902,410	\$26,057,216	\$22,154,806

PIRR: 61.26%
NPV: @12% 8,560,711
@15% 6,935,677
B/C Ratio: 6.68

Note: User savings are the net difference in vehicle operating costs between the without project case and the with project case.

**KAFUE-LUSAKA ROAD EXTENSION PROJECT
FINANCIAL COST ANALYSIS
(WITH VEHICLE OPERATING COST SAVINGS ONLY)**

Table 6.1

Road Length: 3.625 km Sensitivity Analysis of Increase in Capital Costs by 20% Units: U.S\$

Year	COSTS		: BENEFITS		: DISCOUNT FACTOR AT .12			
	Construction Costs	Maintenance Costs	Total Costs	User Savings	Total Benefits	Discounted Costs	Discounted Benefits	Discounted Net Benefits
1994	\$5,244,000	\$0	\$5,244,000	\$0	\$0	\$4,682,892	\$0	(\$4,682,892)
1995		\$0	\$0	\$3,225,669	\$3,225,669	\$0	\$2,570,858	\$2,570,858
1996		\$0	\$0	\$3,470,820	\$3,470,820	\$0	\$2,471,224	\$2,471,224
1997		\$0	\$0	\$3,734,602	\$3,734,602	\$0	\$2,375,207	\$2,375,207
1998		\$0	\$0	\$4,018,432	\$4,018,432	\$0	\$2,278,451	\$2,278,451
1999		\$0	\$0	\$4,171,132	\$4,171,132	\$0	\$2,114,764	\$2,114,764
2000		\$0	\$0	\$4,329,635	\$4,329,635	\$0	\$1,956,995	\$1,956,995
2001		\$0	\$0	\$4,494,161	\$4,494,161	\$0	\$1,815,641	\$1,815,641
2002		\$0	\$0	\$4,664,940	\$4,664,940	\$0	\$1,684,043	\$1,684,043
2003		\$0	\$0	\$4,842,207	\$4,842,207	\$0	\$1,559,191	\$1,559,191
2004		\$0	\$0	\$5,026,211	\$5,026,211	\$0	\$1,618,440	\$1,618,440
2005		\$0	\$0	\$5,217,207	\$5,217,207	\$0	\$1,679,941	\$1,679,941
2006		\$0	\$0	\$5,415,461	\$5,415,461	\$0	\$1,743,778	\$1,743,778
2007		\$0	\$0	\$5,621,249	\$5,621,249	\$0	\$1,810,042	\$1,810,042
2008		\$0	\$0	\$5,834,856	\$5,834,856	\$0	\$1,878,824	\$1,878,824
2009		\$0	\$0	\$6,056,580	\$6,056,580	\$0	\$1,950,219	\$1,950,219
	\$5,244,000	\$0	\$5,244,000	\$70,123,162	\$70,123,162	\$4,682,892	\$29,507,618	\$24,824,726

FIRR: 58.32%
NPV: @12% 8,556,724
@15% 6,735,581
B/C Ratio: 6.30

Note: User savings are the net difference in vehicle operating costs between the without project case and the with project case.

62

**KAFUE-LUSAKA ROAD EXTENSION PROJECT
FINANCIAL COST ANALYSIS
(WITH VEHICLE OPERATING COST SAVINGS ONLY)**

Table 6.2

Road Length: 3.625 km Sensitivity Analysis of a Decrease in User Savings by 20% Units: U.S.

Year	COSTS			: BENEFITS		: DISCOUNT FACTOR AT .12		
	Construction Costs	Maintenance Costs	Total Costs	User Savings	Total Benefits	Discounted Costs	Discounted Benefits	Discounted Net Benefits
1994	\$4,370,000	\$0	\$4,370,000	\$0	\$0	\$3,902,410	\$0	(\$3,902,410)
1995		\$0	\$0	\$2,580,535	\$2,580,535	\$0	\$2,056,687	\$2,056,687
1996		\$0	\$0	\$2,776,656	\$2,776,656	\$0	\$1,976,979	\$1,976,979
1997		\$0	\$0	\$2,987,682	\$2,987,682	\$0	\$1,900,166	\$1,900,166
1998		\$0	\$0	\$3,214,745	\$3,214,745	\$0	\$1,822,761	\$1,822,761
1999		\$0	\$0	\$3,336,906	\$3,336,906	\$0	\$1,691,811	\$1,691,811
2000		\$0	\$0	\$3,463,708	\$3,463,708	\$0	\$1,565,596	\$1,565,596
2001		\$0	\$0	\$3,595,329	\$3,595,329	\$0	\$1,452,513	\$1,452,513
2002		\$0	\$0	\$3,731,952	\$3,731,952	\$0	\$1,347,235	\$1,347,235
2003		\$0	\$0	\$3,873,766	\$3,873,766	\$0	\$1,247,353	\$1,247,353
2004		\$0	\$0	\$4,020,969	\$4,020,969	\$0	\$1,154,018	\$1,154,018
2005		\$0	\$0	\$4,173,766	\$4,173,766	\$0	\$1,072,658	\$1,072,658
2006		\$0	\$0	\$4,332,369	\$4,332,369	\$0	\$992,112	\$992,112
2007		\$0	\$0	\$4,496,999	\$4,496,999	\$0	\$921,885	\$921,885
2008		\$0	\$0	\$4,667,885	\$4,667,885	\$0	\$854,223	\$854,223
2009		\$0	\$0	\$4,845,264	\$4,845,264	\$0	\$789,778	\$789,778
	\$4,370,000	\$0	\$4,370,000	\$56,098,530	\$56,098,530	\$3,902,410	\$20,845,773	\$16,943,363

FIRR: 47.85%
 NPV: @12% 6,151,710
 @15% 4,869,861
 B/C Ratio: 5.34

Note: User savings are the net difference in vehicle operating costs between the without project case and the with project case.

12

Table 6.3
KAFUE-LUSAKA ROAD EXTENSION PROJECT
FINANCIAL COST ANALYSIS
(WITH VEHICLE OPERATING COST SAVINGS ONLY)

Road Length: 3.625 km

Sensitivity Analysis of a 10-Year Project Life

Units: U.S.\$

Year	COSTS			BENEFITS		DISCOUNT FACTOR AT .12		
	Construction Costs	Maintenance Costs	Total Costs	User Savings	Total Benefits	Discounted Costs	Discounted Benefits	Discounted Net Benefits
1994	\$4,370,000	\$0	\$4,370,000	\$0	\$0	\$3,902,410	\$0	(\$3,902,410)
1995		\$0	\$0	\$3,225,669	\$3,225,669	\$0	\$2,570,858	\$2,570,858
1996		\$0	\$0	\$3,470,820	\$3,470,820	\$0	\$2,471,224	\$2,471,224
1997		\$0	\$0	\$3,734,602	\$3,734,602	\$0	\$2,375,207	\$2,375,207
1998		\$0	\$0	\$4,018,432	\$4,018,432	\$0	\$2,278,451	\$2,278,451
1999		\$0	\$0	\$4,171,132	\$4,171,132	\$0	\$2,114,764	\$2,114,764
2000		\$0	\$0	\$4,329,635	\$4,329,635	\$0	\$1,956,995	\$1,956,995
2001		\$0	\$0	\$4,494,161	\$4,494,161	\$0	\$1,815,641	\$1,815,641
2002		\$0	\$0	\$4,664,940	\$4,664,940	\$0	\$1,684,043	\$1,684,043
2003		\$0	\$0	\$4,842,207	\$4,842,207	\$0	\$1,559,191	\$1,559,191
2004		\$0	\$0	\$5,026,211	\$5,026,211	\$0	\$1,442,523	\$1,442,523
	\$4,370,000	\$0	\$4,370,000	\$41,977,809	\$41,977,809	\$3,902,410	\$20,268,896	\$16,366,486

FIRR: 60.99%
NPV: (@12% 7, 10,436
 @15% 6,883,926
B/C Ratio: 5.19

Note: User savings are the net difference in vehicle operating costs between the without project case and the with project case.

60

ENGINEERING TECHNICAL ANALYSIS

1. General

1.1 Introduction

The purpose of this document is to provide the justification for the A) widening from two lanes to four lanes of the 11.1 km. roadway between Makeni-Chilanga and the B) rehabilitation of the 3.6 km. four lane road between the Kafue Traffic Circle in Lusaka and Makeni.

The 3.6 km. Kafue Traffic Circle-Makeni and the 11.1 km. Makeni-Chilanga road sections are part of the road sections between the Kafue Traffic Circle in Lusaka and the Kafue River Road Bridge. As part of the Lusaka-Kafue road, the engineering technical analysis for both sections was discussed in the 1989 feasibility study which recommended the rehabilitation of the road from the Kafue Traffic Circle in Lusaka to the Kafue River Road Bridge. Due to funding shortages at the time of project authorization, the 3.6 km. road section between the Kafue Traffic Circle in Lusaka and Makeni was not considered for rehabilitation. Due to further deterioration of the road surface due to wear and tear and the breaking-off of the shoulders, this section is now being considered for rehabilitation. In addition, an increase in the level of traffic demands that the Kafue Traffic Circle-Makeni road be widened from four to six lanes. Because of a similar increase in the level of traffic and the possibility to use a variation order under the Kafue-Lusaka Road Rehabilitation Project (690-0254), which reduces the cost of construction works, the Makeni-Chilanga road is considered for widening from two lanes to an undivided four lanes.

1.2 Topography, Geology, Rainfall, Climate Vegetation & Land Use

As discussed in sufficient detail in the 1989 feasibility study, the topography, geology, rainfall, and climate of the Kafue Traffic Circle-Makeni and the Makeni-Chilanga remain the same.

The Kafue Traffic Circle-Makeni, which starts at Km. 0 and ends at Km. 3.625 lies on flat low-lying terrain. The Makeni-Chilanga road, from Km 3.900 to Km. 15, lies on a terrain which has a varying vertical profile. At km. 6, the road level rises above the surrounding terrain, between Km. 10 and Km. 11, the road level dips significantly in the vicinity of a stream crossing at Km. 10.5 At Km. 12.5, the vertical alignment rises slowly and falls again in the vicinity of another stream. The road then rises significantly between Km. 12.5 and Km. 13 and then remains fairly flat until reaching Chilanga at Km. 15.

5

The City of Lusaka lies on Late Pre-Cambrian and Lower Paleozoic rocks of the Katanga System, which in turn overlie the Pre-Cambrian Basement Complex. They consist mainly of metamorphic gneisses, schists, quartzites, limestone, and shales. The area south from Lusaka (Km. 8.0) to Kafue (Km. 43.0) consists of dolomites, limestone, gabbro, and schists.

Throughout the year, Zambia has a rainy season from November to March and a dry season from April to October. The hottest months are October and November and the coolest months are June and July. Climatological details for the Lusaka/Chilanga area are summarized as follows:

Mean Monthly Rainfall	836 mm
Average Annual Rainfall	0 - 219 mm
Mean Monthly Evaporation	111 - 284 mm
Mean Relative Humidity	37 - 83 %
Mean Monthly Temperature	15.7 - 24.6 deg C (Centigrade)
Absolute Max. Temperature	31.1 deg C
Absolute Min. Temperature	-1.6 deg C

South of Lusaka, the road is covered with a more open savanna woodland, called "munga". The soils beneath munga vegetation tend to be alluvial and fertile. As a result, much of this vegetation was cleared and the area was used for farmland and grazing. Within the built-up area of Lusaka and as far as Chilanga, little of the original vegetation (munga) is left. Vacant land within the built-up area and considerable areas of land on the periphery of the road are intensively cultivated for maize and vegetables. The Roads Department has already cleared all the dense vegetation and certain trees that are located within the right-of-way to improve drainage and enhance road safety.

2. Existing Condition

2.1 Makeni-Chilanga Road

The rehabilitation of the 11.1 Km. two lane Makeni-Chilanga road from Road Class 1B (with 2 m. shoulder on each side of the 6.7 m. road pavement) to Class 1A (with 3 m. shoulder on each side of the 7.3 road pavement) is already underway under the Kafue-Lusaka Road Rehabilitation Project (690-0254). The widening of this road from a two lane Class 1A road to an undivided four lane road (with 1.8 m. shoulders on each side of the 14.6 m. road pavement) is facilitated by the use of the 3 m. wide shoulders of the existing road for the construction of the additional two lanes. The natural material road foundation, crushed rock base, and hot asphalt mix of the existing two lane road will extend to the additional two lanes. The existing road side ditches are presently placed at sufficient distance and will not have to be filled to provide space for part of the additional two lanes and adjacent shoulders.

66

2.2 Lusaka-Makeni Road

According to the 1989 feasibility study, the existing road pavement was constructed in 1968 and consists of 150 mm. lateritic gravel subbase and 150 mm stabilized lateritic gravel road base and a double bituminous layer as surface course. Since the 1989 feasibility study, traffic volumes have increased on this road and a number of potholes have developed and there is evidence of surface cracking especially at the junction with Lumumba Road and at the busby at Km. 0.5. Due to the breaking-off of the shoulders and consequent narrowing of lanes and the undivided status of this four lane highway, driving at night on this road is not safe because of the presence of headlight glare.

3. Proposed Rehabilitation

3.1 Alignment

There will be no changes in alignment in both the widening from two lanes to four lanes of the Makeni-Chilanga and the rehabilitation of the Kafue Traffic Circle-Makeni. The 1989 feasibility study recommended that the alignment be changed at two locations at Km. 7.5 and at Km. 12.5 to improve sight distance but both re-alignments were dropped in the final design because both curves met satisfactorily the Roads Department Highway Design Standards.

3.2 Makeni-Chilanga Road

3.2.1 Traffic Study And Capacity Analysis

The following report was prepared by the joint venture consultant sheladia/Stanley/Burrow on behalf of the Roads Department.

3.2.1.1 Introduction

For purposes of geometric designs, capacity analysis and pavement design, the volume of present and future traffic volumes and its composition are needed. The size and magnitude of commercial vehicles (large trucks and buses) affects all three but in particular, pavement design and the damage to the pavement structure from the equivalent standard axle loading.

3.2.1.2 Existing Data

The Roads Department and John Burrow & Partners made traffic surveys in 1989. The count point's locations for both are shown on Figure No. 3.8.2. Only two provide past data for this report's road segment - the Roads Department's count at Km 3.95 just to the north of Makeni Junction and John Burrow & Partner's count at Km 1.0 just to the south of Lumumba Road in Lusaka.

The results of these counts are contained in Tables No. 3.8.2 (a) and 3.8.2 (b). A 3-day, 12 hour count was made at Km 1.0 by the Joint Venture in August 1992. The results of that survey are contained in Table No. 3.8.2 (c).

The estimated total 24 hour 1989 traffic volumes at these two points are 12,508 and 16,535 vehicles and 19,360 vehicles at Km 1.0 in August 1992 using factors from Roads Department traffic data.

Table No. 3.8.2 (a)

**ROAD DEPARTMENT'S 12 HOUR TRAFFIC COUNT DATA AT KM 3.95
APRIL 1989**

<u>Day</u>	<u>Light</u> Single <u>Unit</u> <u>Vehicles</u>	<u>Trailer or</u> Semi- <u>Trailer</u> <u>Trucks</u>	<u>Trucks</u>	<u>Buses</u>	<u>Total</u>
Monday	9,758	1,632	313	314	12,017
Tuesday	9,852	1,706	311	366	12,235
Wednesday	8,415	1,362	216	372	10,365
Thursday	9,295	1,613	332	327	11,567
Friday	10,727	1,678	334	391	13,130
Saturday	8,365	1,101	233	287	9,986
Sunday	6,373	643	204	188	7,408
Totals	<u>62,785</u>	<u>9,735</u>	<u>1,943</u>	<u>2,245</u>	<u>76,708</u>
Daily Avg.	8,969	1,391	278	321	10,958

Table No. 3.8.2 (b)

**JOHN BURROW & PARTNERS 12 HOUR
TRAFFIC COUNT DATA AT KM 1.0
MAY 1989**

<u>Vehicle Type</u>	<u>North-Bound</u>	<u>South-Bound</u>	<u>Total</u>
1. Private Cars and Light Utilities	4,745	5,251	9,996
2. 4 Wheel Drive Mini-Buses	1,305	1,058	2,363
3. 2-3 Axle Light Trucks	662	779	1,441
4. 2-3 Axle Trucks with Trailer	115	73	188
5. Articulated Trucks	44	84	128
6. Buses	<u>191</u>	<u>179</u>	<u>370</u>
12 Hour Total	7,062	7,424	14,486
Peak Hour	912(1)	1,003(2)	-
Percentage of 12 Hour	12.9	13.5	-

(1) A.M.

(2) P.M.

Table No. 3.8.2 (c)
JOINT VENTURE 12 HOUR
TRAFFIC COUNT DATA AT KM 1.0 AUGUST 1992

<u>Vehicle Type</u>	<u>North-Bound</u>	<u>South-Bound</u>	<u>Total</u>
1. Private Cars and Light Utilities	4,433	4,270	8,703
2. 4 Wheel Drive Mini-Buses	2,944	2,846	5,790
3. 2-3 Axle Light Trucks	829	956	1,785
4. 2-3 Axle Trucks with Trailer	17	28	45
5. Articulated Trucks	173	235	408
6. Buses	<u>117</u>	<u>116</u>	<u>233</u>
12 Hour Total	8,513	8,451	16,964
Peak Hour	962(1)	1,171(2)	-
Percentage of 12 Hour	11.3	13.9	-

- (1) A.M.
(2) P.M.

3.2.1.3 Current Traffic Data

There are two points between Makeni Junction and the roundabout that cause changes in the traffic volumes and patterns. These are Lumumba Road and Chawama Road Intersections. In November 1992, three-day, 12 hour counts (6 a.m. to 6 p.m.) were taken at the Makeni Road, Chawama Road and Lumumba Road Intersections and a one-day count at the

16

Roundabout. The results of these counts are contained in Tables No. 3.8.3 (a), 3.8.3 (b), 3.8.3 (c) and 3.8.3 (d).

Using factors used in the 1989 Report to convert 12-hour counts to daily volumes, the total daily traffic at the three intersections are shown on Figures No. 3.8.3 (a), 3.8.3 (b) and 3.8.3 (c).

The values shown on the figures show that between Lumumba Road and Chawama Road there is a decrease in the number of vehicles. This decrease is estimated to be caused by traffic to and from a rock crusher and a car wash near Km 2.3, and some minor local roads. The weighted total daily south-bound traffic volume for the section is 9,032 vehicles and 9,068 for north-bound, or a weighted average total of 18,100 vehicles.

The daily traffic at Km 1.0 is 21,323 vehicles which is 4,738 vehicles greater than the 16,585 vehicles for May 1989. The traffic growth rate for the various vehicle types are given in Table No. 3.8.3 (e).

Table No. 3.8.3 (e)

**TRAFFIC VOLUME GROWTH RATE
MAY 1989 TO NOVEMBER 1992**

<u>Vehicle Type</u>	<u>Growth Rate (%)</u>
1. Passenger Cars, Light Utilities and Mini-Buses	+8.4
2. 2-3 Axle Light Trucks	(-4.8)
3. 2-3 Axle Trucks With Trailer	3.2
4. Articulated Trucks	58.3
5. Buses	(-11.0)
6. Total Traffic Stream	7.6

The high growth rate for Type 4 vehicles can probably be attributed to increased trade with South Africa which previously had been regulated by trade restrictions. These restrictions have now been removed. It is also probable that a major portion of this growth has taken place during the last

^

18 months. These rates however, can not be sustained and are anticipated to level off within the next 4 years (a growth rate of 2.5 percent was used in the 1989 report).

A growth rate of 7.6 percent has been used for 1993, 1994, 1995 and 1996 and 3.8 percent thereafter. Using these rates, the predicted average annual daily traffic volumes in 1993, 1995, 2005, 2010 and 2015 are given in Table No. 3.8.3 (f). The average peak hour percentage of the AADT is 12.0 percent which is a two way volume. The peak hour flow assuming 60/40 and 70/30 distribution during that time period are contained in Table No. 3.8.3 (f).

Table No. 3.8.3 (f)

**ESTIMATED FUTURE AADT
MAINLINE**

<u>Year(1)</u>	<u>60/40 Average Annual Daily Traffic</u>	<u>70/30 Peak Hour Flow</u>	<u>Peak Hour Flow</u>
1993	18,300	1,320	1,540
1995	21,200	1,530	1,780
2000	27,420	1,970	2,300
2005	33,040	2,380	2,770
2015	47,980	3,450	4,030

- (1) As of 1st January of that year.
(2) One direction.

3.2.2 CAPACITY ANALYSIS

3.2.2.1 Introduction

A principal objective of capacity analysis is the estimation of the maximum amount of traffic that can be accommodated by a given facility. Capacity analysis would, however, be of limited utility if this were its only focus. Traffic facilities generally operate poorly at or near capacity, and facilities are rarely designed or planned to operate in this range. Capacity analysis is also intended to estimate the maximum amount of traffic that can be

accommodated by a facility while maintaining prescribed operational qualities.

Capacity analysis is, therefore, a set of procedures used to estimate the traffic-carrying ability of facilities over a range of defined operational conditions. It provides tools for the analysis and improvement of existing facilities, and for the design of future facilities.

The definition of operational criteria is accomplished using "levels of service". Ranges of operating conditions are defined for each type of facility, and are related to amounts of traffic that can be accommodated at each level.

The concept of Levels of Service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A LOS definition generally describes these conditions in terms of such factors as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety.

Six LOS are defined in the Transportation Research Board's Highway Capacity Manual. They are given letter designations, from A to F, with LOS A representing the best operating conditions and LOS F the worst.

The various levels of service are briefly defined as follows for uninterrupted flow facilities:

- o Level-of-Service A represents free flow with individual users virtually unaffected by the presence of others in the traffic stream.
- o Level-of-Service B is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable.
- o Level-of-Service C marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The general level of comfort and convenience declines noticeably at this level.
- o Level-of-Service D represents high-density flow with speed and freedom to manoeuvre severely restricted. Small increases in traffic flow will generally cause operational problems at this level.
- o Level-of-Service E represents operating conditions at or near the capacity level. Freedom to manoeuvre within the traffic stream is extremely difficult, and small increases in flow or minor perturbations within the traffic stream will cause breakdowns.

- o Level-of-Service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such locations. Operations within the queue are characterized by stop-and-go waves, and they are extremely unstable.

Service Flow Rates is the maximum rate of flow which can be accommodated by a facility at each LOS, except LOS F, for which flows are unstable. Thus each facility has five service flow rates, one for each level of service (A through E) which is the maximum hourly rate at which vehicles can reasonably be expected to traverse a point or uniform section of a road during a given time period under prevailing roadway, traffic, and control conditions while maintaining a designated level of service.

The Highway Capacity Manual presents specified standard conditions which must be adjusted to account for any prevailing conditions not matching the specified conditions. The specified conditions are normally defined as the "ideal conditions". An ideal condition is one for which further improvement will not achieve any increase in capacity. Typical ideal conditions are:

- o 3.65 meter lane widths.
- o Level terrain.
- o 2 meter clearance from edge of travel lane to the nearest obstruction.
- o All passenger cars in the traffic stream.
- o 110 km/hr design speed for multi-lane highway.
- o No impediments to through traffic due to traffic control or turning vehicles.

Changes to ideal conditions affects the capacity service flow rate and LOS.

3.2.2.2 Existing Road Conditions

The existing road has four, 3 meter wide travel lanes, is located in a level terrain, has a design speed for the two curves of approximately 80 k.p.h. and has light pole obstructions about 1.3 meters from the edge of the outside lanes. In addition, a high percentage of the traffic stream is trucks and buses. All but the level terrain adversely affects the ideal conditions thereby reducing the capacity of the lanes.

3.2.2.3 Analysis of Existing Facility

The general relationship describing traffic operations is as follows:

$$SF_i = C_i \times (v/c)_i \times f_d \times f_w \times f_{HV}$$

Where:

- SF_i = total service flow rate in both directions for prevailing roadway and traffic conditions, for Level of Service i , in vph;
- C_i = capacity in passenger car per hour per lane (pcphpl) for a multi-lane for a selected design speed and Level of Service;
- $(v/c)_i$ = ratio of flow rate to ideal capacity for Level of Service i ;
- f_d = adjustment factor for the development, environmental and type of multi-lane highway;
- f_w = adjustment factor for narrow lanes and restricted shoulder width; and
- f_{HV} = adjustment factor for the presence of heavy vehicles in the traffic stream, computed as:
- $f_{HV} = 1/[1 + P_T(E_T - 1) + P_B(E_B - 1)]$

Where:

- P_T = proportion of trucks in the traffic stream, expressed as a decimal;
- P_B = proportion of buses in the traffic stream, expressed as a decimal;
- E_T = passenger-car equivalent for trucks; and
- E_B = passenger-car equivalent for buses.

The above equation takes the capacity of C , in pcphpl and adjusts.

Using the count values from Table No. 3.8.2 (c) which separated the mini-buses from cars and light vehicles, the percentage of trucks in the traffic stream is 13 and 36 for buses.

The reduction in lane capacity is 12 percent for a three meter wide lane and the nearness of the light poles. The reduction in capacity for abutting side development is five percent in a rural development and 10 to 20 percent in an urban development. For the analysis of the existing conditions a factor of five percent was used and 10 percent for future influence after the road is improved. The road passes through an area that has some development on each side which will increase as a result of improvement to this segment of road as well as the Kafue-Lusaka Road now under construction. This development, combined with intersecting roads and accesses reduces the capacity approximately 15 percent.

The design speed for this section of road has been set at 80 k.p.h. According to the Capacity Manual, the capacity under these conditions is 1900 pcphpl (LOS E).

Applying the factors to the formula the single lane service flow rate for various LOS's are as follows:

<u>LOS</u>	<u>Service Flow Rate</u>
B	390
C	530
D	670
E	870

Using the peak hour flow from Table No. 3.8.3 (f) the required number of lanes in one direction are shown for the indicated years in Table No. 4.3.

Table No. 4.3

**REQUIRED NUMBER OF TRAVEL LANES
IN ONE DIRECTION
EXISTING FACILITY**

	Required Number 60/40 Distribution				Required Number 70/30 Distribution				
	<u>LOS</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>
B	3.9	5.1	6.0	8.8	4.6	5.9	7.1	10.3	
C	2.9	3.7	4.5	6.5	3.4	4.3	5.2	7.6	
D	2.3	2.9	3.6	5.1	2.7	3.4	4.1	6.0	
E	1.8	2.3	2.7	4.0	2.0	2.6	3.2	4.6	

Based upon the preceding analysis, the project road is currently operating near LOS E during peak hour flows and by 1995 will be at LOS F during high peak flows.

3.2.2.4 Analysis of Future Facility

The future road will have 3.65 meter lanes, will still have level terrain, will still have adjacent development and intersecting roads and accesses, but side obstructions such as light-poles will be further away. The percentage of trucks and buses are the same as for the existing facilities analysis and the passenger car equivalent factors for trucks and buses are also the same. The reduction in capacity for abutting side development was selected at 10 percent. Applying the factors to the formula the single lane service flow rate for various LOS's are as follows:

<u>LOS</u>	<u>Service Flow Rate</u>
B	510
C	690
D	870
E	1150

Using the peak hour flow from Table No. 3.8.3 (f) the required number of lanes in one direction are shown for the indicated years in Table No. 4.4.

**Table No. 4.4
REQUIRED NUMBER OF TRAVEL LANES IN ONE DIRECTION
FUTURE FACILITY**

<u>LOS</u>	<u>Required Number 60/40 Distribution</u>				<u>Required Number 70/30 Distribution</u>			
	<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>
B	3.0	3.9	4.7	6.8	3.5	4.5	5.4	7.9
C	2.2	2.9	3.4	5.0	2.6	3.3	4.0	5.8
D	1.8	2.3	2.7	4.0	2.0	2.6	3.2	4.6
E	1.3	1.7	2.0	3.0	1.5	2.0	2.4	3.5

The above analysis indicates that a dual 2-lane road provides a LOS E to about the year 2005. A dual 3-lane road provides LOS E for nearly the entire design period, and LOS C to 2000 and D to near 2005. Based upon the analysis a dual 3-lane road should be provided. See Section 6 for recommendation

3.2.3 Drainage

3.2.3.1 Introduction

This section is concerned with the passage of storm water from one side of the road to the other, and in road curb drainage, parallel ditches carrying the water longitudinally, side drainage structures, and in erosion of road features. The design criteria and empirical formulae and constants applicable to the formulae used in the final designs are contained in this section.

3.2.3.2 Storm Water Runoff

Rational Method: The Rational Method for determining the stormwater runoff is widely used and has proved to be a reliable method where catchment areas do not exceed 500 hectares. For areas exceeding this limit, the method generally over-estimates the runoff. None of the Project's catchments have an area greater than 500 hectares.

The basic Rational Method empirical formula is:

$$Q = K CAI$$

Where Q = Stormwater runoff in cu. meters per sec.

K = 2.755 (a constant).

C = Catchment area's runoff coefficient.

A = Catchment area in hectares.

I = Rainfall intensity in mm per hour.

Design Flood: The selection of a return period is both a matter of the risk in flooding adjacent property and the financial economics in the cost of the drainage features. In keeping with generally accepted practices and since all of the structures will be 600mm diameter pipes, a 10 year return period was used.

Rainfall Intensity: The 1991 Final Design Report used a formula developed by N.P. Smelling. This formula was used for this final design.

$$I = \frac{2.050 \log (tR) - 3.000}{t + 20}$$

Where I = rainfall intensity in mm per hour.

R = mean annual rainfall in mm per annum for the catchment area. For the design a value of 836mm was used.

n = design period in years (period over which, on an average, the given storm will occur once only).

t = time of concentration, time in minutes during which the average rainfall intensity is I . This included a time of entry (t_e) of 5 minutes.

Time of Concentration (t): The time of concentration is related to the shape of the area. The formula to be used for this project is:

$$t = (8.707 L^3)^{0.385} / 10^{10} H$$

Where t = time of concentration in hours.

L = critical path length of catchment on meters.

H = difference in elevation in meters between the head of the watershed and the design point.

The Values of "t" obtained from this formula are considered reasonable for catchment areas less than 15 sq. km.

Run-Off Coefficients (C): Obtaining values to be used for "C" from text and reference books is generally a matter of judgement and some knowledge of the floods that occur within the area. For the final design the following values were used:

<u>Area Type</u>	<u>"C" Value</u>
High density areas	0.55
Medium density areas	0.40
Low density areas	0.30
Savannah land	0.30
Farm land	0.25

Because this section of the road lies within the urban area of Lusaka the surrounding area will eventually be high density. A "C" value of 0.55 has been used for all culvert designs.

3.2.3.3 Flow in Open Drains

The formulae generally used to calculate the capacity of Vee and Trapezoidal ditch drains, both lined and unlined, are:

$$Q = VA$$

Where Q = Carrying capacity of drain in cu.m./sec.

V = Velocity of flow in m/sec.

A = Waterway cross-sectional area in sq.m.

$$V = C m^{0.5} s^{0.5}$$

Where m = Hydraulic mean depth = A/P

P = Wetted perimeter in meters

C = Bazin C

S = Invert grade of the open drain

$$\text{Bazin C} = 87 (1 + 0.5 N)^{-1}$$

Where N = Roughness Coefficient

= 1.3 for unlined drains

= 0.3 for concrete lined drains

3.2.3.4 Other Design Criteria

The following general criteria were used in the final designs:

- o All new drainage structures were designed to operate at non-eroding and, where possible (because of flat terrain) non-sedimenting velocities. The following velocity limits were used:

<u>Type of Surface</u>	<u>Maximum Velocity m/s</u>
Sandy Areas	0.6

Clayey Soil	0.9	
Lateritic Gravel w/o Clay	1.5	
Decomposing Rocks	2.5	1.8
Brick Lining	2.5	
Hard Rock and Concrete Lining	4.0	

- o All culverts are to be replaced if they are in a structurally unsound condition; or are too high or low in respect to the approaching or trailing waterway.
- o Side drains having velocities exceeding design limits for the material encountered must have erosion control measures such as ditch velocity checks incorporated in the design.
- o Minimum size of pipe culverts to be 600mm diameter except in access road culverts where 450mm pipes may be permitted in exceptional cases.

3.2.3.4. Raising the Road Formation

At several locations raising of the road due to insufficient cover of drainage structures may be required.

4 Alternative Pavement Designs

Two alternative pavement design procedures have been presented in preceding sections - one based upon deflections of the existing pavement structure and the other the envelope method used in South Africa. The design of the pavement structure using these two procedures plus a design using the American Association of State Highways and Transportation Official's (AASHTO) Guide for Design of Pavement Structures, 1986 are contained in the following sections.

4.1 Design Using AASHTO Guide

The projected ESA loadings are for north-bound traffic 20.3, 36.3 and 50.2 million for design periods of 10, 15 and 20 years from the 1995 opening year. For the design, it is assumed that the road will be designed for a dual 3-lane facility. The road would be centered 7.3 metres to the left of the centreline of the existing 4-lane pavement to place the three north-bound lanes with the heavier axle-load traffic atop the existing pavement structure.

Surveys taken in United States as reported in the Highway Capacity Manual indicates that 30 percent of Type I and II heavy vehicles use the outside lane of multi-lane highways, 88 percent of Type III and 50 percent of Type IV.

For this section of the road this translates into 50 percent of the ESA loading using the outside lane. Other references suggest 50 to 80 percent. Because the beginning and ending of the north-bound outside lane are continuous movement lanes from side roads, more heavy traffic will use the centre lane. Therefore the design 50 percent of the ESA loading has been assigned the outside lane. The 10, 15 and 20 year design ESA loading is therefore 10.2, 18.2 and 25.1 million for the three design periods respectively.

The following design is based upon the Design Guide. The reliability factor from Table 2.2 of the Guide suggests 80 to 90 for an urban road and 75 to 95 for rural. This factor is introduced so as to incorporate some degree of certainty into the design process to ensure that the various elements will last the analysis period.

The serviceability of a pavement is defined as its ability to serve the type of traffic. The measure of this serviceability is an index which ranges from 0 (impossible road) to 5 (perfect road). Selection of the lowest index that the public will consider acceptable is

suggested to be 2.5 percent for a major road. Because the design is sensitive to an acceptable serviceability loss, a value of 2.2 was selected for this road. The upper limit cannot be achieved and the manual suggests a value of 4.2 for flexible pavements. The serviceability change is therefore 4.2 less 2.2 or 2.0.

The reliability factor from Table No. 2.2 of the Guide is a function of the overall standard deviation (S_o) that accounts for both chance variation in the traffic prediction and normal variation in pavement performance prediction for a given ESA loading. The standard deviation (S_o) suggested by the Guide for flexible pavement is 0.45 (Section 2.1.3 of the Guide).

The design layer co-efficients suggested in Figure No. 5.2.3 and/or the Guide are 0.44 for asphaltic hot-mix, 0.20 for asphaltic cold-mixes and 0.14 for a crushed rock base. The coefficient for a penetration macadam is estimated to be between 0.20 and 0.40 and a value of 0.30 has been used.

The co-efficient for cement stabilized granular base is 0.15 for a base with an UCS = 2.0 MPa and 0.20 for one with a 3.5 MPa.

Natural subbase material will have a co-efficient of 0.11 for a material with a 30 CBR and 0.10 for a 25 CBR.

The drainage of the road is considered to be good and surrounding water of the subbase removed within one day. Table 2.4 of the Guide indicates that no modification to the design is necessary.

The coefficient for a penetration macadam is estimated to be between 0.20 and 0.30 and a value of 0.25 has been used.

The north-bound lane will be constructed atop the existing pavement. The effective roadbed soil resilient modulus (M_R) was not determined during the geotechnical investigations but the M_R should be well above 20,000 psi for the existing pavement. For example, the M_R for a subbase layer with a CBR of 25 is 13,500. Since the average CBR value is 56 for the pavement structure in-place a M_R value of 20,000 is considered to be appropriate.

Figure No. 5.4.1 is a copy of a monograph from the Manual for solving the formula that combines all the design elements as has been described to give the design structural numbers (SN). The SN is the sum of the layer co-efficients times their thickness. The monograph's SN

gu

4.2 Design Based Upon Pavement Deflection

The recommended design deflection value is 80mm/100. Using this value, curves shown on Figure No. 5.2.1 (e) and an ESA loading of 25.1 million for a 20 year design, the thickness of an asphalt hot-mix overlay is 165mm. Using the equivalency values given in Figure No. 5.2.3 of 0.44 for asphalt hot-mix, 0.22 for crushed rock base over a stabilized sub-base and 0.15 for cement stabilized sub-base with a UCS of 2.0 MPa, the following pavement structure is indicated:

<u>Layer</u>	<u>Design A</u>		<u>Design B</u>	
	<u>Thickness</u>	<u>SN</u>	<u>Thickness</u>	<u>SN</u>
Asphalt Hot-Mix	60mm	2.64	25mm	1.00
Penetration Macadam	-	-	100mm	3.00
Crushed Rock Base	150mm	3.30	-	-
Stab. Rock Base	-	-	100mm	2.00
Cement Stab. Sub-base	150mm	2.25	-	-
Natural Sub-base	-	-	150mm	1.50
Totals	310mm	7.44	375mm	7.50
Asphalt Hot-Mix	165mm	7.26		

4.3 Design Using Envelope Method

Figure No. 5.2.1 (f) is a chart showing the recommended pavement structures for Road Categories A, B, C and five Design Traffic Classes as given in TRH4, South Africa, 1985. Project Road would be Category A and Traffic Class E4.

The traffic level for Class E4 varies from 12 to 50 million ESA loading. The projected traffic level for Project Road is 25.1 million ESA or the mid-point of the Envelope's E4 traffic limits. Assuming that the pavement structure for Class E3 represents a traffic level of 12 million and Class E4 for a traffic level of 50 million ESA loading, an appropriate mid-level structure would have 45mm of asphalt hot-mix, 230mm of crushed rock base and 150mm of stabilized sub-base. Increasing the hot-mix to 60mm results in the following pavement structure:

<u>Layer</u>	<u>Thickness</u>	<u>SN</u>
Asphalt Hot-Mix	60mm	2.64
Crushed Rock Base	170mm	3.74
3.5MPa Cement Stab. Sub-base	150mm	3.00
	---	----
Totals	420mm	9.38

4.4 Recommended Pavement Structure

It is recommended that the new northbound lanes be positioned directly above the existing pavement structure. As a result, the new southbound lanes will be constructed on top of a new fill formation which will not have the in-situ structural strength as the existing fill formation. The ESA traffic loading however is less for the southbound lanes than for the northbound (13.1 to 25.1 million ESA).

The pavement structures using 60mm asphalt hot-mix surfacing for the three design methods are contained in Table No. 5.4.4. Alternate pavement structures using penetration macadam are contained in Table No. 5.4.4(b).

Table No. 5.4.4(a)

**SUMMARY OF PAVEMENT STRUCTURE
ASPHALT HOT-MIX SURFACING**

<u>Layer</u>	<u>Thickness by Design Method</u>		
	<u>AASHTO</u>	<u>DEFLECTION</u>	<u>ENVELOPE</u>
Asphalt Hot-Mix	60	60	60
Crushed Rock Base	150	150	210
2.0 MPa Cement Stab. Sub-base	150	100	150
Natural Materials Sub-base	150	-	-
	---	---	---
Total	510	310	420
SN	9.69	7.44	9.59

must be multiplied by 2.5 to convert inches into centimetres.

Using the design loading of 25.1 million for the design lane, a reliability factor of 85, standard deviation of 0.45, a resilient modulus of 20,000 psi and a serviceability change of 2.0 gives a SN of 3.90. Multiplying by 2.5 gives a SN of 9.75.

4.1.1 Pavement Using 60mm of Asphaltic Hot-Mix

The SN for 60mm of asphaltic hot-mix is $0.44 (6) = 2.64$ which leaves a SN balance of 7.11 for the other layers. A 150mm layer of crushed rock based over a cement stabilized subbase has a SN of 3.30 which leaves a SN balance of 3.81. A 150mm of 2.0 MPa cement treated subbase has a SN of 2.25 leaving a SN balance of 1.56 or 150mm of natural subbase.

Total thickness of pavement structure is 510mm.

4.1.2 Pavement Using Triple Surface Treatment

A 220mm layer of crushed rock base over a cement stabilized sub-base has a SN of 4.84 leaving a SN balance of 4.91. A 150mm layer of 3.5 MPa cement treated subbase has a SN of 3.00 leaving a balance of 1.91 or 200 mm of natural subbase. The pavement would be surfaced with a triple seal, chipped wearing course. Total thickness of pavement structure is 570mm not including thickness of wearing course.

4.1.3 Pavement Using Asphaltic Penetration Macadam

A 100mm layer of penetration macadam will have a SN of 3.00 leaving a SN balance of 6.75. Because of porous characteristic of the macadam it is desirable a cement stabilized base be placed below the macadam. A 150mm thick layer of 3.5 MPa cement stabilized base has a SN of 3.0 leaving a SN balance of 3.75. Placing a 250mm layer of natural subbase with CBR of 25 as the bottom layer (SN = 3.0) leaves a SN balance of 1.25.

Hot-Mix Wearing Course: The penetration macadam must be overlaid with a pavement wearing course. Small portable hot-mix plants capable of producing an average of 20 to 25 tons per hour can be rented by Contractors. Using a 25mm hot-mix layer with a coefficient of 0.40 gives a SN of 1.00 which is satisfactory. A single seal course using 10mm chipping should be placed between the hot-mix and macadam.

Table No. 5.4.4(b)

**SUMMARY OF PAVEMENT STRUCTURE
ASPHALTIC PENETRATION MACADAM**

<u>Layer</u>	<u>Thickness By Design Method</u>		
	<u>AASHTO</u>	<u>DEFLECTION</u>	<u>ENVELOPE</u>
Asphaltic Hot-Mix	25	25	25
Penetration Macadam	100	100	100
Cement Stab. Rock Base	150	100	150
Natural Materials Sub-base	250	150	240
Total	525	375	515
SN	9.50	7.50	9.40

Crushed rock base cost is approximately the same as for cement stabilized base (or sub-base) and places a constraint on contractors whose crusher is not sufficiently large to produce aggregates for surfacing, concrete and graded rock base. Alternatives should be provided that allow competitive tendering but at the same time maintaining a quality pavement structure. Table No. 5.4.4(c) and (d) contain the recommended pavement structures to be contained in the tender bill of quantities. The pavement structures are different for the north and south bound lanes because of the residue strength of the existing pavement.

Table No. 5.4.4(c)

**RECOMMENDED PAVEMENT ALTERNATIVES
FOR NORTH-BOUND LANES**

<u>Pavement Layer Type</u>	<u>Thickness of Layer (mm)</u>		
	<u>Alt. A</u>	<u>Alt. B</u>	<u>Alt. C (RD)</u>
Asphaltic Hot-Mix	25	25	25
Penetration Macadam (a)	-	100	100
Stab. Rock Base	150	100	150
Natural Sub-base	150	100	100
Total Thickness	360	325	450
SN	7.14	7.00	7.00

- (a) A single 10mm bituminous seal atop the penetration macadam.
- (b) Triple bituminous seal overlaying the penetration macadam.

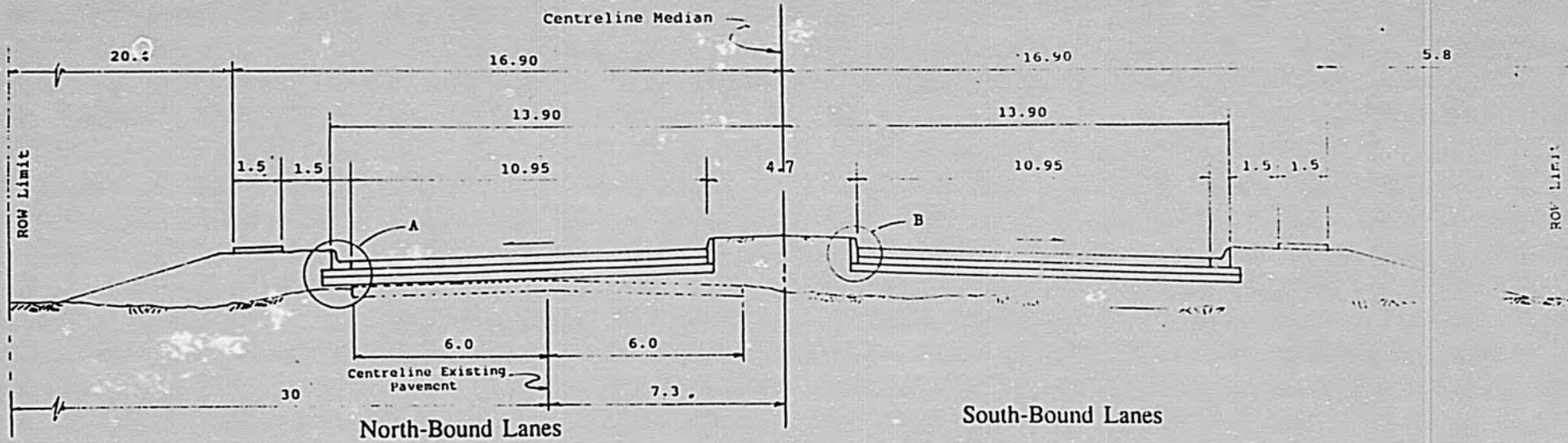
88

Table No. 5.4.4(d)

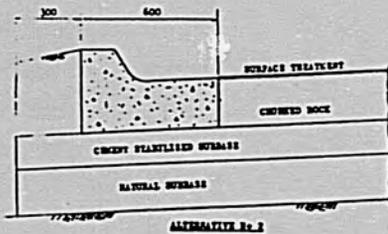
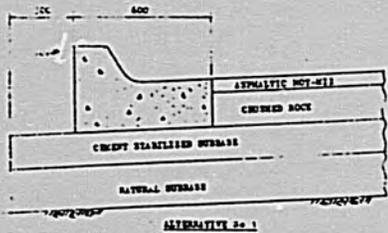
RECOMMENDED PAVEMENT ALTERNATIVE
FOR SOUTH-BOUND LANES

Pavement Layer Type	Thickness of Layer (mm)		
	<u>Alt. D</u>	<u>Alt. E</u>	<u>Alt. F (b)</u>
Asphaltic Hot-Mix	60	25	-
Penetrator. Macadam (a)	-	100	100
Stab. Rock Base	-	150	150
Rock Base	150		
Stab. Sub-base	150		
Natural Sub-base	150	250	300
Total Thickness	510	525	550
SN	9.69	9.50	9.00

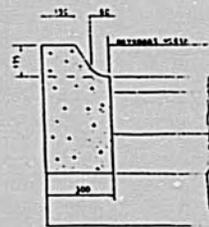
- (a) A single 10mm bituminous seal atop the penetration macadam.
 (b) Triple bituminous seal overlaying the penetration macadam.



TYPICAL ROADWAY SECTION



DETAIL A



DETAIL B

Figure No. 6.3 (a)

**PROPOSED
TYPICAL SECTION**

5C(2) - ASSISTANCE CHECKLIST

Listed below are statutory criteria applicable to the assistance resources themselves, rather than to the eligibility of a country to receive assistance. This section is divided into three parts. Part A includes criteria applicable to both Development Assistance and Economic Support Fund resources. Part B includes criteria applicable only to Development Assistance resources. Part C includes criteria applicable only to Economic Support Funds.

CROSS REFERENCE: IS COUNTRY CHECKLIST UP TO DATE?

A. CRITERIA APPLICABLE TO BOTH DEVELOPMENT ASSISTANCE AND ECONOMIC SUPPORT FUNDS

1. Host Country Development Efforts
(FAA Sec. 601(a)): Information and conclusions on whether assistance will encourage efforts of the country to:
(a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture, and commerce; and (f) strengthen free labor unions.

- (a) Yes, a major objective is to increase imports and exports
- (b) N/A
- (c) N/A
- (d) N/A
- (e) Yes, the Project will increase the efficiency of marketing by reducing transport times and costs
- (f) N/A

2. U.S. Private Trade and Investment
(FAA Sec. 601(b)): Information and conclusions on how assistance will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

N/A

3. Congressional Notification

a. General requirement (FY 1993 Appropriations Act Sec. 522; FAA Sec. 634A): If money is to be obligated for an activity not previously justified to Congress, or for an amount in excess of

Yes, CN expired on June 12, 1993

amount previously justified to Congress, has Congress been properly notified (unless the Appropriations Act notification requirement has been waived because of substantial risk to human health or welfare)?

b. **Notice of new account obligation** (FY 1993 Appropriations Act Sec. 514): If funds are being obligated under an appropriation account to which they were not appropriated, has the President consulted with and provided a written justification to the House and Senate Appropriations Committees and has such obligation been subject to regular notification procedures?

N/A

c. **Cash transfers and nonproject sector assistance** (FY 1993 Appropriations Act Sec. 571(b)(3)): If funds are to be made available in the form of cash transfer or nonproject sector assistance, has the Congressional notice included a detailed description of how the funds will be used, with a discussion of U.S. interests to be served and a description of any economic policy reforms to be promoted?

N/A

4. **Engineering and Financial Plans** (FAA Sec. 611(a)): Prior to an obligation in excess of \$500,000, will there be: (a) engineering, financial or other plans necessary to carry out the assistance; and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

Yes

5. **Legislative Action** (FAA Sec. 611(a)(2)): If legislative action is required within recipient country with respect to an obligation in excess of \$500,000, what is the basis for a reasonable expectation that such act will be completed in time to permit orderly accomplishment of the purpose of the assistance?

N/A

6. **Water Resources** (FAA Sec. 611(b); FY 1993 Appropriations Act Sec. 501): If project is for water or water-related land

N/A

resource construction, have benefits and costs been computed to the extent practicable in accordance with the principles, standards, and procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See A.I.D. Handbook 3 for guidelines.)

7. Cash Transfer and Sector

Assistance (FY 1993 Appropriations Act Sec. 571(b)): Will cash transfer or nonproject sector assistance be maintained in a separate account and not commingled with other funds (unless such requirements are waived by Congressional notice for nonproject sector assistance)?

N/A

8. Capital Assistance (FAA Sec.

611(e)): If project is capital assistance (e.g., construction), and total U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability to maintain and utilize the project effectively?

Yes'

9. Multiple Country Objectives (FAA

Sec. 601(a)): Information and conclusions on whether projects will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

- (a) Yes, a major objective is to increase exports and imports
- (b) N/A
- (c) N/A
- (d) N/A
- (e) Yes, the project will increase the efficiency of marketing by reducing transport costs
- (f) N/A

10. U.S. Private Trade (FAA Sec. 601(b)):

Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

N/A

11. Local Currencies

a. **Recipient Contributions** (FAA

Secs. 612(b), 636(h)): Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.

The host country has contributed local currency to finance costs of design and maintenance

b. U.S.-Owned Currency (FAA Sec. 612(d)): Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

No

c. Separate Account (FY 1993 Appropriations Act Sec. 571). If assistance is furnished to a foreign government under arrangements which result in the generation of local currencies:

N/A

(1) Has A.I.D. (a) required that local currencies be deposited in a separate account established by the recipient government, (b) entered into an agreement with that government providing the amount of local currencies to be generated and the terms and conditions under which the currencies so deposited may be utilized, and (c) established by agreement the responsibilities of A.I.D. and that government to monitor and account for deposits into and disbursements from the separate account?

(2) Will such local currencies, or an equivalent amount of local currencies, be used only to carry out the purposes of the DA or ESF chapters of the FAA (depending on which chapter is the source of the assistance) or for the administrative requirements of the United States Government?

(3) Has A.I.D. taken all appropriate steps to ensure that the equivalent of local currencies disbursed from the separate account are used for the agreed purposes?

(4) If assistance is terminated to a country, will any unencumbered balances of funds remaining in a separate account be disposed of for purposes agreed to by the recipient government and the United States

Government?

12. Trade Restrictions

a. **Surplus Commodities (FY 1993 Appropriations Act Sec. 520(a)):** If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity? N/A

b. **Textiles (Lautenberg Amendment) (FY 1993 Appropriations Act Sec. 520(c)):** Will the assistance (except for programs in Caribbean Basin Initiative countries under U.S. Tariff Schedule "Section 807," which allows reduced tariffs on articles assembled abroad from U.S.-made components) be used directly to procure feasibility studies, prefeasibility studies, or project profiles of potential investment in, or to assist the establishment of facilities specifically designed for, the manufacture for export to the United States or to third country markets in direct competition with U.S. exports, of Textiles, apparel, footwear, handbags, flat goods (such as wallets or coin purses worn on the person), work gloves or leather wearing apparel? N/A

13. Tropical Forests (FY 1991 Appropriations Act Sec. 533(c)(3) (as referenced in section 532(d) of the FY 1993 Appropriations Act): Will funds be used for any program, project or activity which would (a) result in any significant loss of tropical forests, or (b) involve industrial timber extraction in primary tropical forest areas? N/A

14. PVO Assistance

a. **Auditing and registration (FY 1993 Appropriations Act Sec. 536):** If assistance is being made available to a PVO, has that organization provided upon timely request any document, file, or record necessary to the auditing requirements of A.I.D., and is the PVO registered with A.I.D.? N/A

b. **Funding sources (FY 1993 Appropriations Act, Title II, under heading** N/A

"Private and Voluntary Organizations"): If assistance is to be made to a United States PVO (other than a cooperative development organization), does it obtain at least 20 percent of its total annual funding for international activities from sources other than the United States Government?

15. **Project Agreement Documentation** (State Authorization Sec. 139 (as interpreted by conference report)): Has confirmation of the date of signing of the project agreement, including the amount involved, been cabled to State L/T and A.I.D. LEG within 60 days of the agreement's entry into force with respect to the United States, and has the full text of the agreement been pouched to those same offices? (See Handbook 3, Appendix 6G for agreements covered by this provision).

Standard procedures for notification will be followed.

16. **Metric System** (Omnibus Trade and Competitiveness Act of 1988 Sec. 5164, as interpreted by conference report, amending Metric Conversion Act of 1975 Sec. 2, and as implemented through A.I.D. policy): Does the assistance activity use the metric system of measurement in its procurements, grants, and other business-related activities, except to the extent that such use is impractical or is likely to cause significant inefficiencies or loss of markets to United States firms? Are bulk purchases usually to be made in metric, and are components, subassemblies, and semi-fabricated materials to be specified in metric units when economically available and technically adequate? Will A.I.D. specifications use metric units of measure from the earliest programmatic stages, and from the earliest documentation of the assistance processes (for example, project papers) involving quantifiable measurements (length, area, volume, capacity, mass and weight), through the implementation stage?

The project uses the metric system for all specifications.

17. **Women in Development** (FY 1993 Appropriations Act, Title II, under heading "Women in Development"): Will assistance be designed so that the percentage of women participants will be demonstrably increased?

Women, primarily responsible for marketing, are expected to benefit from an increased number of markets.

18. Regional and Multilateral Assistance
(FAA Sec. 209): Is assistance more efficiently and effectively provided through regional or multilateral organizations? If so, why is assistance not so provided? Information and conclusions on whether assistance will encourage developing countries to cooperate in regional development programs.

This is a regional project.

19. Abortions (FY 1993 Appropriations Act, Title II, under heading "Population, DA," and Sec. 524):

N/A

a. Will assistance be made available to any organization or program which, as determined by the President, supports or participates in the management of a program of coercive abortion or involuntary sterilization?

b. Will any funds be used to lobby for abortion?

20. Cooperatives (FAA Sec. 111): Will assistance help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward a better life?

N/A

21. U.S.-Owned Foreign Currencies

a. **Use of currencies** (FAA Secs. 612(b), 636(h); FY 1993 Appropriations Act Secs. 507, 509): Are steps being taken to assure that, to the maximum extent possible, foreign currencies owned by the U.S. are utilized in lieu of dollars to meet the cost of contractual and other services.

N/A

b. **Release of currencies** (FAA Sec. 612(d)): Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

22. Procurement

a. **Small business** (FAA Sec. 602(a)): Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?

U.S. contractors were not interested in construction contract. A joint venture with a U.S. firm is involved in design and supervision.

b. **U.S. procurement** (FAA Sec. 604(a))

as amended by section 597 of the FY 1993 Appropriations Act): Will all procurement be from the U.S., the recipient country, or developing countries except as otherwise determined in accordance with the criteria of this section?

No

c. **Marine insurance** (FAA Sec. 604(d)): If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company?

N/A

d. **Non-U.S. agricultural procurement** (FAA Sec. 604(e)): If non-U.S. procurement of agricultural commodity or product thereof is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)

N/A

e. **Construction or engineering services** (FAA Sec. 604(g)): Will construction or engineering services be procured from firms of advanced developing countries which are otherwise eligible under Code 941 and which have attained a competitive capability in international markets in one of these areas? (Exception for those countries which receive direct economic assistance under the FAA and permit United States firms to compete for construction or engineering services financed from assistance programs of these countries.)

No

f. **Cargo preference shipping** (FAA Sec. 603)): Is the shipping excluded from compliance with the requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 percent of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent such vessels are available at fair and reasonable rates?

N/A

g. **Technical assistance** (FAA Sec. 621(a)): If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest

Yes

64

extent practicable? Will the facilities and resources of other Federal agencies be utilized, when they are particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

h. U.S. air carriers

(International Air Transportation Fair Competitive Practices Act, 1974): If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available?

N/A

i. Termination for convenience of U.S. Government (FY 1993 Appropriations Act Sec. 504): If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States?

Project uses host country contract.

j. Consulting services

(FY 1993 Appropriations Act Sec. 523): If assistance is for consulting service through procurement contract pursuant to 5 U.S.C. 3109, are contract expenditures a matter of public record and available for public inspection (unless otherwise provided by law or Executive order)?

Yes

k. Metric conversion

(Omnibus Trade and Competitiveness Act of 1988, as interpreted by conference report, amending Metric Conversion Act of 1975 Sec. 2, and as implemented through A.I.D. policy): Does the assistance program use the metric system of measurement in its procurements, grants, and other business-related activities, except to the extent that such use is impractical or is likely to cause significant inefficiencies or loss of markets to United States firms? Are bulk purchases usually to be made in metric, and are components, subassemblies, and semi-fabricated materials to be specified in metric units when economically available and technically adequate? Will A.I.D. specifications use metric units of measure from the earliest programmatic stages, and from the earliest documentation of the

Project uses the metric system for specifications. This does not cause a loss of market to U.S. firms.

assistance processes (for example, project papers) involving quantifiable measurements (length, area, volume, capacity, mass and weight), through the implementation stage?

1. **Competitive Selection Procedures** (FAA Sec. 601(e)): Will the assistance utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Competitive selection was originally used. Negotiated amendment to the existing contract will be attempted first.

23. **Construction**

a. **Capital project** (FAA Sec. 601(d)): If capital (e.g., construction) project, will U.S. engineering and professional services be used?

A joint venture firm with U.S. participation is providing engineering services.

b. **Construction contract** (FAA Sec. 611(c)): If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?

Yes, see 22.1 above.

c. **Large projects, Congressional approval** (FAA Sec. 620(k)): If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million (except for productive enterprises in Egypt that were described in the Congressional Presentation), or does assistance have the express approval of Congress?

Does not exceed \$100 million.

24. **U.S. Audit Rights** (FAA Sec. 301(d)): If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights?

Yes

25. **Communist Assistance** (FAA Sec. 620(h)). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries?

Yes

26. **Narcotics**

a. **Cash reimbursements** (FAA Sec. 483): Will arrangements preclude use of

Yes

100

financing to make reimbursements, in the form of cash payments, to persons whose illicit drug crops are eradicated?

b. Assistance to narcotics traffickers (FAA Sec. 487): Will arrangements take "all reasonable steps" to preclude use of financing to or through individuals or entities which we know or have reason to believe have either: (1) been convicted of a violation of any law or regulation of the United States or a foreign country relating to narcotics (or other controlled substances); or (2) been an illicit trafficker in, or otherwise involved in the illicit trafficking of, any such controlled substance? Yes

27. Expropriation and Land Reform (FAA Sec. 620(g)): Will assistance preclude use of financing to compensate owners for expropriated or nationalized property, except to compensate foreign nationals in accordance with a land reform program certified by the President? Yes

28. Police and Prisons (FAA Sec. 660): Will assistance preclude use of financing to provide training, advice, or any financial support for police, prisons, or other law enforcement forces, except for narcotics programs? Yes

29. CIA Activities (FAA Sec. 662): Will assistance preclude use of financing for CIA activities? Yes

30. Motor Vehicles (FAA Sec. 636(i)): Will assistance preclude use of financing for purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained? Project amendment will not purchase vehicles.

31. Military Personnel (FY 1993 Appropriations Act Sec. 503): Will assistance preclude use of financing to pay pensions, annuities, retirement pay, or adjusted service compensation for prior or current military personnel? Yes

32. Payment of U.N. Assessments (FY 1993

Appropriations Act Sec. 505): Will assistance preclude use of financing to pay U.N. assessments, arrearages or dues? Yes

33. **Multilateral Organization Lending** (FY 1993 Appropriations Act Sec. 506): Will assistance preclude use of financing to carry out provisions of FAA section 209(d) (transfer of FAA funds to multilateral organizations for lending)? Yes

34. **Export of Nuclear Resources** (FY 1993 Appropriations Act Sec. 510): Will assistance preclude use of financing to finance the export of nuclear equipment, fuel, or technology? Yes

35. **Repression of Population** (FY 1993 Appropriations Act Sec. 511): Will assistance preclude use of financing for the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights? Yes

36. **Publicity or Propaganda** (FY 1993 Appropriations Act Sec. 516): Will assistance be used for publicity or propaganda purposes designed to support or defeat legislation pending before Congress, to influence in any way the outcome of a political election in the United States, or for any publicity or propaganda purposes not authorized by Congress? Yes

37. **Marine Insurance** (FY 1993 Appropriations Act Sec. 560): Will any A.I.D. contract and solicitation, and subcontract entered into under such contract, include a clause requiring that U.S. marine insurance companies have a fair opportunity to bid for marine insurance when such insurance is necessary or appropriate? N/A

38. **Exchange for Prohibited Act** (FY 1993 Appropriations Act Sec. 565): Will any assistance be provided to any foreign government (including any instrumentality or agency thereof), foreign person, or United States person in exchange for that foreign government or person undertaking No assistance will be provided for actions prohibited by U.S. law.

16

any action which is, if carried out by the United States Government, a United States official or employee, expressly prohibited by a provision of United States law?

39. **Commitment of Funds (FAA Sec. 635(h)):**
Does a contract or agreement entail a commitment for the expenditure of funds during a period in excess of 5 years from the date of the contract or agreement?

No

40. **Impact on U.S. Jobs (FY 1993 Appropriations Act, Sec. 599):**

(a) Will any financial incentive be provided to a business located in the U.S. for the purpose of inducing that business to relocate outside the U.S. in a manner that would likely reduce the number of U.S. employees of that business?

No

(b) Will assistance be provided for the purpose of establishing or developing an export processing zone or designated area in which the country's tax, tariff, labor, environment, and safety laws do not apply? If so, has the President determined and certified that such assistance is not likely to cause a loss of jobs within the U.S.?

No

(c) Will assistance be provided for a project or activity that contributes to the violation of internationally recognized workers rights, as defined in section 502(a)(4) of the Trade Act of 1974, of workers in the recipient country?

No

CRITERIA APPLICABLE TO DEVELOPMENT ASSISTANCE ONLY

1. **Agricultural Exports (Bumpers Amendment)** (FY 1993 Appropriations Act Sec. 521(b), as interpreted by conference report for original enactment): If assistance is for agricultural development activities (specifically, any testing or breeding feasibility study, variety improvement or introduction, consultancy, publication, conference, or training), are such activities:
(1) specifically and principally designed to

N/A

1/32

increase agricultural exports by the host country to a country other than the United States, where the export would lead to direct competition in that third country with exports of a similar commodity grown or produced in the United States, and can the activities reasonably be expected to cause substantial injury to U.S. exporters of a similar agricultural commodity; or (2) in support of research that is intended primarily to benefit U.S. producers?

2. **Tied Aid Credits (FY 1993 Appropriations Act, Title II, under heading "Economic Support Fund"):** Will DA funds be used for tied aid credits? N/A

3. **Appropriate Technology (FAA Sec. 107):** Is special emphasis placed on use of appropriate technology (defined as relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)? N/A

4. **Indigenous Needs and Resources (FAA Sec. 281(b)):** Describe extent to which the activity recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government. The project will improve transportation within the country.

5. **Economic Development (FAA Sec. 101(a)):** Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth? Yes

6. **Special Development Emphases (FAA Secs. 102(b), 113, 281(a)):** Describe extent to which activity will: (a) effectively involve the poor in development by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, dispersing investment from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of

- (a) The project will employ Zambian laborers
- (b) N/A
- (c) N/A
- (d) N/A
- (e) Improved regional road network will stimulate intra-regional trade

108

development on a sustained basis, using appropriate U.S. institutions; (b) encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries.

7. Recipient Country Contribution (FAA Secs. 110, 124(d)): Will the recipient country provide at least 25 percent of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?

N/A. This is a regional project.

8. Benefit to Poor Majority (FAA Sec. 128(b)): If the activity attempts to increase the institutional capabilities of private organizations or the government of the country, or if it attempts to stimulate scientific and technological research, has it been designed and will it be monitored to ensure that the ultimate beneficiaries are the poor majority?

N/A

9. Abortions (FAA Sec. 104(f); FY 1993 Appropriations Act, Title II, under heading "Population, DA," and Sec. 534):

N/A

a. Are any of the funds to be used for the performance of abortions as a method of family planning or to motivate or coerce any person to practice abortions?

b. Are any of the funds to be used to pay for the performance of involuntary sterilization as a method of family planning or to coerce or provide any financial incentive to any person to undergo sterilizations?

c. Are any of the funds to be made available to any organization or program which, as determined by the President, supports or participates in the management of a program of coercive abortion or

involuntary sterilization?

d. Will funds be made available only to voluntary family planning projects which offer, either directly or through referral to, or information about access to, a broad range of family planning methods and services?

e. In awarding grants for natural family planning, will any applicant be discriminated against because of such applicant's religious or conscientious commitment to offer only natural family planning?

f. Are any of the funds to be used to pay for any biomedical research which relates, in whole or in part, to methods of, or the performance of, abortions or involuntary sterilization as a means of family planning?

g. Are any of the funds to be made available to any organization if the President certifies that the use of these funds by such organization would violate any of the above provisions related to abortions and involuntary sterilization?

10. **Contract Awards** (FAA Sec. 601(e)): Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Competitive selection was originally used. Negotiated amendment to existing contract will be attempted first.

11. **Disadvantaged Enterprises** (FY 1993 Appropriations Act Sec. 563): What portion of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, colleges and universities having a student body in which more than 40 percent of the students are Hispanic Americans, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or who are economically or socially disadvantaged (including women)?

The project uses host country contracting procedures which do not set aside any contracts.

12. **Biological Diversity** (FAA Sec.

166

119(g): Will the assistance: (a) support training and education efforts which improve the capacity of recipient countries to prevent loss of biological diversity; (b) be provided under a long-term agreement in which the recipient country agrees to protect ecosystems or other wildlife habitats; (c) support efforts to identify and survey ecosystems in recipient countries worthy of protection; or (d) by any direct or indirect means significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas?

N/A

13. Tropical Forests (FAA Sec. 118; FY 1991 Appropriations Act Sec. 533(c) as referenced in section 532(d) of the FY 1993 Appropriations Act):

a. A.I.D. Regulation 16:

Does the assistance comply with the environmental procedures set forth in A.I.D. Regulation 16?

Yes

b. Conservation: Does the assistance place a high priority on conservation and sustainable management of tropical forests? Specifically, does the assistance, to the fullest extent feasible: (1) stress the importance of conserving and sustainably managing forest resources; (2) support activities which offer employment and income alternatives to those who otherwise would cause destruction and loss of forests, and help countries identify and implement alternatives to colonizing forested areas; (3) support training programs, educational efforts, and the establishment or strengthening of institutions to improve forest management; (4) help end destructive slash-and-burn agriculture by supporting stable and productive farming practices; (5) help conserve forests which have not yet been degraded by helping to increase production on lands already cleared or degraded; (6) conserve forested watersheds and rehabilitate those which have been deforested; (7) support training,

N/A

107

research, and other actions which lead to sustainable and more environmentally sound practices for timber harvesting, removal, and processing; (8) support research to expand knowledge of tropical forests and identify alternatives which will prevent forest destruction, loss, or degradation; (9) conserve biological diversity in forest areas by supporting efforts to identify, establish, and maintain a representative network of protected tropical forest ecosystems on a worldwide basis, by making the establishment of protected areas a condition of support for activities involving forest clearance or degradation, and by helping to identify tropical forest ecosystems and species in need of protection and establish and maintain appropriate protected areas; (10) seek to increase the awareness of U.S. Government agencies and other donors of the immediate and long-term value of tropical forests; (11) utilize the resources and abilities of all relevant U.S. government agencies; (12) be based upon careful analysis of the alternatives available to achieve the best sustainable use of the land; and (13) take full account of the environmental impacts of the proposed activities on biological diversity?

c. **Forest degradation:** Will assistance be used for: (1) the procurement or use of logging equipment, unless an environmental assessment indicates that all timber harvesting operations involved will be conducted in an environmentally sound manner and that the proposed activity will produce positive economic benefits and sustainable forest management systems; (2) actions which will significantly degrade national parks or similar protected areas which contain tropical forests, or introduce exotic plants or animals into such areas; (3) activities which would result in the conversion of forest lands to the rearing of livestock; (4) the construction, upgrading, or maintenance

- (1) No
- (2) No
- (3) No
- (4) No
- (5) No
- (6) No

of roads (including temporary haul roads for logging or other extractive industries) which pass through relatively undergraded forest lands; (5) the colonization of forest lands; or (6) the construction of dams or other water control structures which flood relatively undergraded forest lands, unless with respect to each such activity an environmental assessment indicates that the activity will contribute significantly and directly to improving the livelihood of the rural poor and will be conducted in an environmentally sound manner which supports sustainable development?

d. **Sustainable forestry:** If assistance relates to tropical forests, will project assist countries in developing a systematic analysis of the appropriate use of their total tropical forest resources, with the goal of developing a national program for sustainable forestry?

N/A

e. **Environmental impact statements:** Will funds be made available in accordance with provisions of FAA Section 117(c) and applicable A.I.D. regulations requiring an environmental impact statement for activities significantly affecting the environment?

No

14. **Energy** (FY 1991 Appropriations Act Sec. 533(c) as referenced in section 532(d) of the FY 1993 Appropriations Act): If assistance relates to energy, will such assistance focus on: (a) end-use energy efficiency, least-cost energy planning, and renewable energy resources, and (b) the key countries where assistance would have the greatest impact on reducing emissions from greenhouse gases?

N/A

15. **Debt-for-Nature Exchange** (FAA Sec. 463): If project will finance a debt-for-nature exchange, describe how the exchange will support protection of: (a) the world's oceans and atmosphere, (b) animal and plant species, and (c) parks and reserves; or describe how the exchange will promote.

N/A

1089

(d) natural resource management, (e) local conservation programs, (f) conservation training programs, (g) public commitment to conservation, (h) land and ecosystem management, and (i) regenerative approaches in farming, forestry, fishing, and watershed management.

16. **Deobligation/Reobligation**
(FY 1993 Appropriations Act Sec. 515): If deob/reob authority is sought to be exercised in the provision of DA assistance, are the funds being obligated for the same general purpose, and for countries within the same region as originally obligated, and have the House and Senate Appropriations Committees been properly notified? N/A

17. **Loans**

a. **Repayment capacity** (FAA Sec. 122(b)): Information and conclusion on capacity of the country to repay the loan at a reasonable rate of interest. N/A

b. **Long-range plans** (FAA Sec. 122(b)): Does the activity give reasonable promise of assisting long-range plans and programs designed to develop economic resources and increase productive capacities? N/A

c. **Interest rate** (FAA Sec. 122(b)): If development loan is repayable in dollars, is interest rate at least 2 percent per annum during a grace period which is not to exceed ten years, and at least 3 percent per annum thereafter? N/A

d. **Exports to United States** (FAA Sec. 620(d)): If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20 percent of the enterprise's annual production during the life of the loan, or has the requirement to enter into such an agreement been waived by the President because of a national security interest? N/A

18. **Development Objectives** (FAA Secs. 102(a), 111, 113, 261(a)): Extent to which N/A

activity will: (1) effectively involve the poor in development, by expanding access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (2) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (3) support the self-help efforts of developing countries; (4) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (5) utilize and encourage regional cooperation by developing countries?

19. Agriculture, Rural Development and Nutrition, and Agricultural Research
(FAA Secs. 103 and 103A):

a. Rural poor and small farmers:

If assistance is being made available for agriculture, rural development or nutrition, describe extent to which activity is specifically designed to increase productivity and income of rural poor; or if assistance is being made available for agricultural research, has account been taken of the needs of small farmers, and extensive use of field testing to adapt basic research to local conditions shall be made.

N/A

b. Nutrition: Describe extent to which assistance is used in coordination with efforts carried out under FAA Section 104 (Population and Health) to help improve nutrition of the people of developing countries through encouragement of increased production of crops with greater nutritional value; improvement of planning, research, and education with respect to nutrition, particularly with reference to improvement and expanded use of indigenously produced foodstuffs; and the undertaking of pilot or demonstration programs explicitly addressing the problem of malnutrition of poor and vulnerable people.

N/A

c. **Food security:** Describe extent to which activity increases national food security by improving food policies and management and by strengthening national food reserves, with particular concern for the needs of the poor, through measures encouraging domestic production, building national food reserves, expanding available storage facilities, reducing post harvest food losses, and improving food distribution. N/A

20. **Population and Health** (FAA Secs. 104(b) and (c)): If assistance is being made available for population or health activities, describe extent to which activity emphasizes low-cost, integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems, and other modes of community outreach. N/A

21. **Education and Human Resources Development** (FAA Sec. 105): If assistance is being made available for education, public administration, or human resource development, describe (a) extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, and strengthens management capability of institutions enabling the poor to participate in development; and (b) extent to which assistance provides advanced education and training of people of developing countries in such disciplines as are required for planning and implementation of public and private development activities. N/A

22. **Energy, Private Voluntary Organizations, and Selected Development Activities** (FAA Sec. 106): If assistance is being made available for energy, private voluntary organizations, and selected development problems, describe extent to which activity is: N/A

a. concerned with data collection and analysis, the training of skilled personnel, research on and development of suitable energy sources, and pilot projects to test new methods of energy production; and facilitative of

research on and development and use of small-scale, decentralized, renewable energy sources for rural areas, emphasizing development of energy resources which are environmentally acceptable and require minimum capital investment;

b. concerned with technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

c. research into, and evaluation of, economic development processes and techniques;

d. reconstruction after natural or manmade disaster and programs of disaster preparedness;

e. for special development problems, and to enable proper utilization of infrastructure and related projects funded with earlier U.S. assistance;

f. for urban development, especially small, labor-intensive enterprises, marketing systems for small producers, and financial or other institutions to help urban poor participate in economic and social development.

23. Capital Projects (Jobs Through Export Act of 1992, Secs. 303 and 306(d)): If assistance is being provided for a capital project, is the project developmentally sound and will the project measurably alleviate the worst manifestations of poverty or directly promote environmental safety and sustainability at the community level?

Yes

ACT: AID-3 INFO: AMB DCM

27 MAY 1993

VZCZCESA674BCA294
PP RUEHLS
DE RUEHC #9759 1460732
ZNR UUUUU ZZH
P 250732Z MAY 93
FM SECSTATE WASHDC
TO RUEHLS/AMEMBASSY LUSAKA PRIORITY 4720
INFO RUEHSB/AMEMBASSY HARARE NAIROBI PRIORITY 4515
BT
UNCLAS STATE 159759

LDC: 057/058 399
25 MAY 93 0750
CN: 34727
CHRG: AID
DIST: AID

AIDAC, NAIROBI FOR REDSO RLA
E.O. 12356: N/A

TAGS:
SUBJECT: SARP--REGIONAL TRANSPORT REHABILITATION II
PROJECT, KAFUE-LUSAKA ROAD (690-0254), AD HOC DOA

REF: (A) LUSAKA 190, (B) LUSAKA 01001

ACTION N/A	DUE DATE 6/3
TRANSFER	INFO
ACTION TAKEN	
DATE	INITIALS

1. ACTING AA/AFR HEREBY DELEGATES AUTHORITY TO THE DIRECTOR, USAID/ZAMBIA, OR TO THE PERSON ACTING IN THAT CAPACITY, TO AUTHORIZE AND IMPLEMENT AN AMENDMENT TO THE SUBJECT PROJECT, IN AN AMOUNT NOT TO EXCEED DOLLARS 5.5 MILLION, FOR A NEW AUTHORIZED LOP OF NOT TO EXCEED DOLLARS 28.84 MILLION. THIS AD HOC DOA SHALL BE EXERCISED IN ACCORDANCE WITH ALL THE OTHER TERMS AND CONDITIONS OF DOA 551 AND SUBJECT TO THE FOLLOWING PROVISIONS:

A. AN AMENDED 611(E) CERTIFICATION MUST BE SIGNED BY THE MISSION DIRECTOR AND CONSIDERED BY AA/AFR.

3. FUNDS MAY NOT BE OBLIGATED UNTIL A NOTIFICATION CLEARS CONGRESS WITHOUT OBJECTION.

2. THE BUREAU NOTES THAT AN IEE FOR THE WORK CONTAINED IN THIS AMENDMENT WAS APPROVED BY THE BUREAU ENVIRONMENTAL OFFICER ON APRIL 5, 1993. GC/AFR CONCURRED APRIL 6, 1993.

3. AID/W STRONGLY URGES THAT THE GRZ AGREEMENT TO MAKE UP ANY FUTURE SHORTFALL IN THE MAINTENANCE FUND FROM ITS OWN RESOURCES BE RECORDED AS A COVENANT IN THE GRANT AGREEMENT AMENDMENT. THIS GIVES AID MORE LEVERAGE TO ENFORCE ITS PERFORMANCE BY ENABLING AID TO TIE NON-PERFORMANCE TO BREACH OF THE PROJECT AGREEMENT. THIS WOULD REFLECT A COMMITMENT TO PROVIDE THE FUNDS FROM THE MINISTRY OF FINANCE, THE ENTITY WHICH IS MORE LIKELY THAN THE ROADS DEPARTMENT TO CONTROL THIS DECISION.

4. AFR/SA WISHES TO REMIND THE MISSION THAT TO THE EXTENT POSSIBLE IT SHOULD IDENTIFY AND ADDRESS ALL PERTINENT ISSUES PRIOR TO REQUESTING ACTION FROM AID/W ON PROJECT AMENDMENTS AND OTHER SUCH PROJECT ACTIONS. THE MISSION'S REQUEST FOR AD HOC DELEGATION PER REF A, DATED JAN 14, 1993, COULD HAVE BEEN PROCESSED MORE EXPEDITIOUSLY IF AFR/SA HAD NOT BEEN REQUIRED TO RAISE AND RESOLVE ISSUES (CONCERNING REF. B) WHICH COULD HAVE BEEN MORE

APPROPRIATELY AND EFFICIENTLY HANDLED AT THE FIELD LEVEL.

114

ACTION MEMORANDUM FOR THE MISSION DIRECTOR, USAID/ZAMBIA

DATE: June 24, 1993

FROM: Val R. Mahan, GDO 

SUBJECT: Southern Africa Regional Program (SARP) -- Regional Transport Development II Project, Kafue-Lusaka Road Rehabilitation (690-0254); Host Country Contracting for the Construction of the Makeni-Lusaka Portion.

PROBLEM: Your approval is required to permit a negotiated contract between the Roads Department and Kajima Corporation, the construction contractor for the current project.

BACKGROUND:

Funding for the Kafue-Lusaka road, authorized on July 26, 1990, is for road rehabilitation from the Kafue Bridge to Makeni, in the outskirts of Lusaka. Rehabilitation of the 3.6 km of dual carriageway leading from Makeni to the Kafue Circle in Lusaka was dropped from the original project design due to a lack of available funding. The Mission is currently preparing a Project Paper Supplement which will authorize funding in the amount of roughly \$3.4 million for the rehabilitation of this section.

Kajima Corporation is the construction contractor for the existing host country construction contract with total funding of \$17.2 million. They were awarded the contract after two tenders. The first tender was set aside because all of the bids exceeded the funds available for the contract. Kajima was the next to lowest bid in the second tender and the lowest bidder was set aside as being not responsible. There were no U.S. bidders for either of the tenders, despite efforts by this Mission and the Embassy to solicit interest by U.S. firms.

In requesting the Delegation of Authority to authorize this new construction work, (Lusaka 00190, dated 1/14/93) the Mission advised AID/W that it was our expectation that the award for this work would be accomplished through open tender. This course of action was contemplated based on the time available to issue tenders and award a contract. The Delegation of Authority was granted on May 26, 1993 (State 159759).

DISCUSSION:

In stating that the new work for the Makeni-Kafue Circle portion would be awarded by tender, the Mission calculated that there was roughly a seven month window between January 1993 and the end of July 1993 for the tender process to proceed. This would permit initial work to begin before the onset of the rainy season and the final work could be completed in late 1994. However, obtaining the delegation of authority from AID/W consumed 19

weeks. An award by tender, even with pre-qualified bidders, could not take place until the rainy season, with the consequence that the work program will extend well into 1995. This has obvious financial consequences for the project.

Handbook 11, Country Contracting, Chapter 2, Section 2.3.3a. 1. Waiver -- Negotiation with a Single Source, provides relief for this constraint in that it is possible to waive competition when:

The Borrower/Grantee wishes to utilize the contractor for additional work outside the scope of the original contract and the contractor is still mobilized at the site or for some other reason the contractor is so closely related to the project that the utilization of the contractor would effect a substantial saving of time or money.

This is clearly the case in this instance. Work is on-going on the Kafue-Chilanga section, and will shift to the Makeni-Chilanga section in the near future, putting construction operations directly contiguous to the Makeni-Lusaka section. The contractor's main camp is located in Makeni and nearby borrow pits are identified and in use. It would be impossible for another contractor to mobilize for this project without significant cost increases due to the cost of mobilization. Further, a negotiated amendment to the existing contract will have the presumption of fairness and reasonableness, since the costs will be negotiated from a starting point of competitive costs established in the existing contract.

The Mission Noncompetitive Review Board, consisting of the Regional Legal Advisor, the Regional Contracting Officer, The Agricultural Development Officer (a senior project officer) and the Mission Competition Advocate, have reviewed the circumstances of this waiver as set out herein, and recommend your issuance of the waiver as called for in Handbook 11, 3.3.3c. 2.

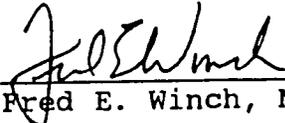
AUTHORITY

Handbook 11 Country Contracting, Section 2.3.3a. 1., cited above, provides the circumstances when single source negotiations are appropriate. Section 2.3.3c. 2. provides that the Mission Director may approve a negotiated procurement estimated to cost \$5 million or less, from a single source and for procurements estimated to be in excess of \$250,000, based upon the recommendation of the Mission Noncompetitive Review Board as set out in this section.

116

RECOMMENDATION:

That you sign below to indicate your approval of a waiver of competition to permit single source negotiation for construction of the dual carriageway from Makeni to the Kafue Circle in Lusaka at an estimated cost of less than \$ 5 million.

Approved: 
Fred E. Winch, Mission Director

Disapproved: _____
Fred E. Winch, Mission Director

Date: 29 June 1993

Drafted: VRMahan, GDO
Clearance: DStraley, PDO DWS
JPoster, ADO JP
BKosheleff, A/DIR B/K 6/24/93
AHussen, ENG AP 6/24/93
RLA, TFillinger J 6/29/93
RCO, KKester J 6/29/93
REDSO/ESA/ENG, RBraden RB 6/29/93

Doc:A:/ACTMEMO:6/24/93

117

ACTION MEMORANDUM FOR THE MISSION DIRECTOR, USAID/ZAMBIA

DATE: June 25, 1993

FROM: Val R. Mahan, GDO 

SUBJECT: Southern Africa Regional Program (SARP) -- Regional Transport Development II Project, Kafue-Lusaka Road Rehabilitation (690-0254); Host Country Contracting for Engineering Supervision Services.

PROBLEM: Your approval is required for an amendment in the contract between the Roads Department and Sheladia, Stanley and Burrow, a Joint Venture, to permit additional work to supervise new construction contemplated in the current project.

BACKGROUND:

Funding for the Kafue-Lusaka road, authorized on July 26, 1990, is for road rehabilitation from the Kafue Bridge to Makeni, in the outskirts of Lusaka. The Mission is preparing a Project Paper Supplement to add \$5.5 million to the project to permit additional construction of 11.1 km of dual carriageway for the Makeni-Chilanga section of the road and new construction of 3.6 km of dual carriageway leading from Makeni to the Kafue Circle in Lusaka.

The Roads Department has a contract with Sheladia, Stanley and Burrow (SSB), a Joint Venture, to provide design and engineering supervision services for the A.I.D.-financed Kafue - Makeni portion of the road. Within this contract, and in preparation for requesting the Mission to augment the existing project to permit the new work noted above, the Roads Department, using GRZ-owned counterpart funds, issued variation orders to the SSB contract to authorize them to prepare conceptual and final design documents for that new work. The Mission is preparing a PP Supplement to permit this new work, based largely on the very great savings which may be realized by using the current construction contractor, Kajima Corporation, who is currently mobilized and working on the main project. In order to maintain the necessary impetus to retain the savings available from having the construction contractor employed without interruption, the Roads Department is requesting Mission approval of an amendment to the current contract between Roads Department and SSB to finance supervision services for the Makeni-Lusaka section of the work contemplated in the PP Supplement.

Engineering supervision of the Makeni-Lusaka section is estimated to cost \$700,000 and to run from roughly September 1993 until November 1994. The long duration of this 3.6 km section is attributable to the interruption caused by the rainy season running from roughly December 1993 until March 1994.

DISCUSSION:

Handbook 11 Country Contracting, Chapter 1, 2.4.2a.4 states that a waiver of competition may be considered when:

The Borrower/Grantee desires to use a contractor previously engaged in the project for follow-on work and the contractor clearly has special capability by virtue of previous experience in the work but the contractor was either not selected on a competitive basis or the Contracting Agency did not advise all competing firms that a follow-on contract might result. A waiver on these grounds should be granted only after careful review of all pertinent facts.

SSB was selected for the engineering work for the project as a result of full and open competition. The RFP for this work retained standard language (Clauses 12 and 16 and 7.(m) of the TOR) relative to the potential for additional design work, but did not speak to the issue of additional work in the area of engineering supervision. (It is generally assumed in the industry, however, that the firm that does the design work will do the engineering supervision.) Overall, however, it may be argued that the RFP did not clearly set out the potential for follow-on work.

Due to its familiarity with the job, SSB has a special capability to undertake this follow-on work. Having done the conceptual and final designs, along with necessary design adjustments for the Kafue-Makeni sections as well as the engineering supervision of construction for this section, SSB is in a paramount position as regards an understanding of the technical aspects of the 3.6 km continuation of this route, the Makeni-Lusaka section. SSB has done (financed independently by the GRZ) the conceptual and final designs (not yet approved by A.I.D.) for the planned Makeni-Lusaka portion. Finally, John Burrow and Partners (Zambia), a member of the SSB joint venture, was the firm that did the A.I.D.-financed feasibility study of the Makeni-Lusaka section, when it was included in the original project design. As noted above, it is customary in the industry for the firm doing the design work to continue with the engineering supervision of the construction phase.

A further consideration is that it is expected that Kajima Corporation, the construction contractor for the current road rehabilitation work, will be awarded the work for the Makeni-Lusaka section through an amendment to the present contract. (A separate waiver of competition in this regard is in process.) It is therefore reasonable to expect that SSB would continue to maintain the existing successful relationship with that contractor for this follow-on work without disruptive delays due to re-tendering for consultant engineering services.

It should also be noted that this amendment to the SSB contract will also provide for the engineering supervision of the

construction of the additional carriageway from Makeni to Chilanga at no extra cost since the four months of supervision of this section will fall within the window of construction of the Makeni-Lusaka section, and thus entail no additional level of effort. Not to enter into this amendment, however, would entail funding a variation order for the four month extension to work on the Makeni-Chilanga section.

It is expected that costs for follow-on services by SSB would be fair and reasonable as they would be negotiated on the basis of existing prices modified by escalators present in the existing contract.

The Mission Noncompetitive Review Board, consisting of the Regional Legal Advisor, the Regional Contracting Officer, The Agricultural Development Officer (a senior project officer) and the Mission Competition Advocate, have reviewed the circumstances of this waiver as set out herein, and recommend your issuance of the waiver as called for in Handbook 11, Chapter 1, 2.4.2a.4 and 2.4.2b.

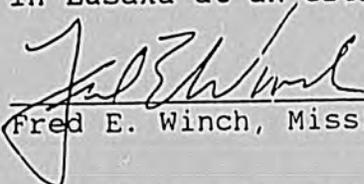
AUTHORITY

Handbook 11 Country Contracting, Chapter 1, sections 2.4.2a.4. and 2.4.2b, cited above, provide the circumstances when single source negotiations are appropriate. Section 2.4.2c.2 provides that the Mission Director may approve a negotiated procurement estimated to cost \$5 million or less, from a single source and for procurements estimated to be in excess of \$250,000, based upon the recommendation of the Mission Noncompetitive Review Board as set out in this section.

RECOMMENDATION:

That you sign below to indicate your approval of a waiver of competition to permit an amendment to the SSB contract for engineering supervision of construction of the dual carriageway from Makeni to the Kafue Circle in Lusaka at an estimated cost of less than \$ 5 million.

Approved: _____


Fred E. Winch, Mission Director

Disapproved: _____

Fred E. Winch, Mission Director

Date: 29 June 1993

Drafted: VRMahan, GDO
Clearance: ABussen, Eng. BKosheleff, A/DIR
DStraley, PDO RLA, TFillinger
JFoster, ADO RCO, KKester
RBraden, REDSO/ESA/ENG